

# amateur radio

DECEMBER, 1974  
VOL. 42, No. 12

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The high rise antenna farm of Eric VK2BEK. See article on page 9.

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# amateur radio

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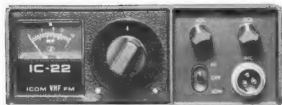
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- ★ W.I.A. Members are reminded that notices for their 1975 subscriptions will soon be on the way to them, but read on.
- ★ As in previous years, the annual subscription rates are composed of several elements.
- ★ In simplest terms, each subscription comprises a Federal part and a Divisional part. The Federal part is determined each year in advance by the Federal Council and for 1975 is \$9.80.
- ★ The Divisional part is the difference between the Federal Part and the total subscription rate which is determined separately for each grade by each Divisional Council.
- ★ Because of centralised processing of subscriptions done on a strictly commercial and audited basis subscriptions are payable direct to the W.I.A. Executive office, P.O. Box 150, Toorak, Vic. 3142.
- ★ The office retains the Federal part of the subscriptions and remits to each Division from time to time the Divisional portions of all the subscriptions received.
- ★ The processing of subscriptions forms part of the EDP system from which address labels for AR are produced.
- ★ AR address labels are automatically suppressed for those members who remain unfinancial after a short period of grace covering the first issues of the year; missing issues are not sent.
- ★ If AR is undelivered and is returned to sender the address label is forthwith suppressed until a fresh address is received from that member.
- ★ Missing issues of AR are despatched with the next bulk postings where it was not a fault of the member that he did not receive them.

- ★ AR costs a lot of money to produce and distribute and absorbs the leisure time of a great many volunteers.
  - ★ The 1975 notional element for AR in each member's subscription is \$5.04 for the whole year — this is only 42c per issue and is the main portion of the Federal part of subscriptions.
  - ★ The Federal part also includes 30c IARU levy and not less than 50c towards the costs of the annual Federal Convention previously funded out of Divisional monies. The \$3.96 balance making up the total Federal dues of \$9.80 goes towards the expenses of the Executive and the Executive office.
  - ★ The full metropolitan member rates for 1975 have been set out by each Division as follows—
- |     | Div. portion | Grand Total |
|-----|--------------|-------------|
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| VK2 |              |             |
| VK3 | \$7.70       | \$17.50     |
| VK4 | \$5.20       | \$15.00     |
| VK5 | \$5.70       | \$15.50     |
| VK6 | \$5.20       | \$15.00     |
| VK7 | \$2.20       | \$12.00     |
- ★ The metropolitan associate member rates for 1975 are —
- |     | Div. portion | Grand Total |
|-----|--------------|-------------|
| VK1 | \$5.20       | \$15.00     |
| VK2 |              |             |
| VK3 | \$7.20       | \$17.00     |
| VK4 | \$5.20       | \$15.00     |
| VK5 | \$4.20       | \$14.00     |
| VK6 | \$3.70       | \$13.50     |
| VK7 | \$0.20       | \$10.00     |
- ★ Lower subscription rates apply for pensioners, students, families and juniors in the EDP grades S, G and X. The Federal element for those who receive AR (S and G grades) is \$5.04 AR plus 30c IARU making a total of \$5.34 for

the full year 1975. This is a flow-on from a Federal Council decision.

- ★ The Divisional portion of subscriptions is applied by the Division towards the cost of providing or maintaining the Headquarters facility including, in the case of NSW and Victoria, a paid Administrative Secretary and office functions. The Division also provides liaison with the local Radio Branch and other organisations, broadcasts, beacons, repeater facilities and bulletins, classes and YRCS, WICEN and VHF activities, equipment, components and publications sales and numerous other functions including QSL Bureaux, perhaps a library, technical advice and general assistance to individuals or groups.
- ★ The Federal part of subscriptions goes towards the costs of AR and providing for the Executive office and staff to process subscriptions and membership records. The Executive co-ordinates and carries out WIA policies as determined by Federal Council, negotiations with Federal bodies such as the Central Office of the Radio Branch, organisation of all-Australia awards, contests and the like, liaison with overseas sister Societies and support for the IARU and IARU Region 3 organisation. The Executive Office also handles "Magpups" activities, printing the Call Book and other items such as certificates, awards and leaflets, advertising in AR and the Call Book and many other central functions.
- ★ Unfortunately virtually nothing can escape the effects of inflation. The Institute needs your continuing support.

EXECUTIVE

## CW NETWORK

From Sunday 20th October, the CW net will run on 7025 kHz from 10.00 a.m. E.A.S.T. to 12 noon. The SSB commentary will be held only after the CW net on the last Sunday of each month. The frequency will be from 7045-7050 kHz to avoid QRM with RTTY operation.

### VK2AV for CW net

## NZART 1975 CONFERENCE

"The conference committee would like to extend to our fellow amateurs from across the sea an invitation to attend our annual conference of NZART" writes T21AYQ, Publicity Officer for the conference to be held from 31st May to 3rd June 1975, in Rotorua, of puyee year. He suggests that any VK intending to tour New Zealand should do so about that time so as to include the conference in their itinerary, at which they will be made most welcome. Write for further details to the Conference Secretary, P.O. Box 1864, Rotorua.

There is a conference net on the 4th Thursday of each month at 08.00 Z on the 80 m band outside our allowable frequency range (on 3.725 MHz).

The Singapore Amateur Radio Transmitting Society (SARTS) has been admitted to membership of the IARU Region 3 Association thus bringing the total membership of the Association up to nine.

### LOGGING REQUIREMENTS IN THE U.S.A.

"Now that FCC, in all its magnanimity, has come forward with reduced logging requirements for amateur stations, the amount of paper work in connection with operating an amateur station figures to decrease drastically" writes WINJNM in the Operating News column QST Sept. '74. "In fact," he says, "all your log will really tell you is when (i.e. what date) you started operating from your present location, and the dates between which you operated from any previous locations". He goes on to say though that all amateurs are urged to continue to keep an accurate and detailed log of their station operation, just as they have always done — whether required by FCC rules or not.

## SCL LOGIC

"This new logic", writes Jim Fisk in Aug. '74 Ham Radio Editorial, "which is called SCL (for space-charge-limited) outperforms all other logic, power-wise, at switching rates over 1 MHz. Cmos circuits, while low-power kings at the lower frequencies, require more power than SCL devices at frequencies above 1 MHz. Furthermore, SCL devices theoretically should have all the low-noise performance of vacuum tubes because they have the same built-in noise cancellation that comes with space-charge-limited current flow."

## WARC 1979 PREPARATIONS

Group A Spectrum Planning Sub-Committee Working Party on the Amateur Services meeting in Washington since early 1974) have also proposed new amateur bands at 10.1-10.6 MHz, 18.1-18.6 MHz and 24.0-24.5 MHz. With communications satellites assuming more and more of the burden of long-distance commercial and government traffic, these enlarged HF amateur allocations are a distinct possibility. Editorial in July '74 Ham Radio.

## A Digital Readout for Transceivers

ROY HARTKOPF, VK3AOH

34 Toolangi Road, Alphington, 3078

There are many advantages in using a digital readout, not least being the fact that it saves a lot of space around the critical front panel area and in addition it can be more accurate than the most expensive, elaborate and cumbersome dial mechanism. This article describes a 3 decade readout with 1 kHz resolution.

About a year ago Ron, VK3BDM and I started working on the design of a SSB transceiver. While looking for ideas, we came across the series of articles by Harold Hepburn and Ken Niabet published in AR during 1968 and 1969. We decided to use the same type of VFO generator, namely a 10 to 70.5 MHz VFO mixed with a 48 MHz crystal to give an output of 56 to 56.5 MHz. There is no doubt that a high frequency VFO does help to reduce spurious responses in the receiver and those interested in the details should refer to the article in AR of December 1968.

However, we had another reason for choosing this particular type of circuit. We had been playing with the idea of having a digital readout using a light emitting diode display instead of the nor-

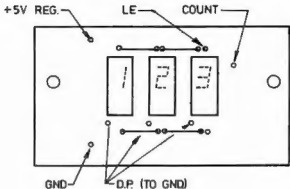


FIG. 2 DISPLAY BOARD (DISPLAY SIDE)

mal dial. There were two important requirements; firstly that the circuit had to be relatively simple and compact and secondly that the cost should be reasonably low.

Finally, as long as the crystal oscillator which provides the timing gate does not drift there is never any need to recalibrate because the readout measures the actual frequency and not the mechanical position of the tuning capacitor.

One of the problems in using a counting circuit is that, as mentioned above, there needs to be some accurate reference frequency which can be divided down to supply the timing gate. And, of course, any additional oscillator permanently running in a sensitive receiver is another possible source of trouble in the way of spurious responses. However, in the VFO arrangement mentioned above, the problem was already solved for there was the 46 MHz crystal oscillator already in the VFO generator and this was running permanently both on transmit and receive and would provide the necessary reference frequency.

The other requirement for any type of frequency counter is to have some means of frequency count and here again this particular arrangement enabled the requirement to be solved very simply. The VFO oscillator goes from 10 MHz to 10.5 MHz and by having a three digit readout and a gating system which selects the display in kilocycles it was possible to have a readout which displayed the frequency in kilocycles regardless of which band happened to be in use. One simply looked at the reading on the band change switch and added the reading shown on the display. On the 3.5 MHz band of course one had to remember to add 3.5 MHz to the kilohertz reading. For instance a digital reading of 125 kilohertz has to be added

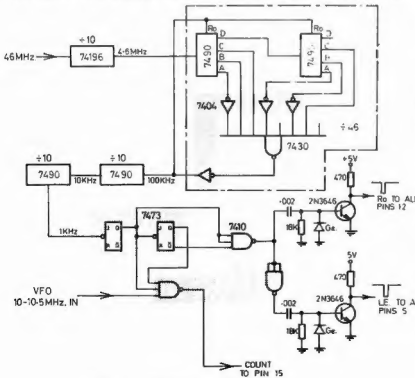


FIG. 1 CIRCUIT SCHEMATIC

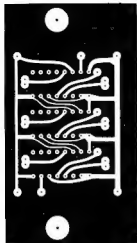


Fig. 3—Copper side of display board (actual size).

not to 3 MHz but to 3.5 MHz, making the actual frequency 3.625 MHz. But on the 7, 14, 21, 27, 28 and 29 MHz bands the reading is directly as it is shown on the LED display.

For those who are interested the logic diagram is shown in Fig. 1. A high frequency decade counter SN 74196 is used in the first stage. This will nominally handle frequencies up to 50 MHz but in fact most of the ICs will go higher. Following this it is possible to use the slower speed (they still go up to 30 MHz or higher!) standard decade counters such



Roy, VESACH tries to save precious time by combining soldering practice with amateur radio. Like most other projects the home brew two metre transceiver is still waiting on final modifications before completion.

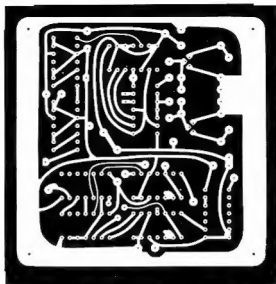


Fig. 4—Copper side of main logic Board (actual size).

as the 7490. These, together with the hex inverters 7404 and the 7430 which is an eight input NAND gate, make up a divide by 46 facility which brings the frequency down to 100 kilohertz. From there two more 7490s divide by a hundred to bring the frequency down to 1 kilohertz. Thus we arrive at the final timing frequency which operates the 7473 flip flop and the 7410 triple NAND gate which comprise the gating and reset system. The 1 kilohertz frequency is of course extremely stable. In fact, the crystal would have to

shift by 46 kilohertz before the timing frequency shifted even one hertz. (A 46 kHz shift in the 46 MHz crystal would still produce a 9 kHz readout error.—Tech. Ed.)

Apart from the integrated circuits the only other components needed are a couple of transistors, capacitors and resistors for operating the reset and latch facilities of the LED display. Three leads, one for the count, one for the latch and one for the zero reset are the only signal connections between the main logic board and the display.

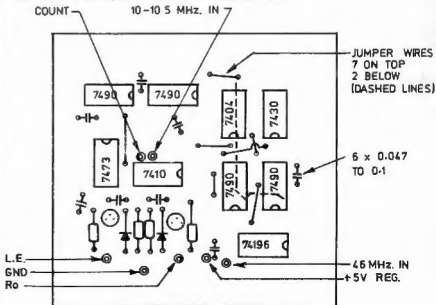


FIG. 5 MAIN LOGIC BOARD



The display itself uses three LED displays type TIL 306. These are slightly more costly than some other LED displays but they were chosen because they have built-in the complete counting logic including the counter, the latch, the decoder, and the limiting resistors for the LED display. The result is that the whole of the display system can be mounted on a board only 1½ inches wide by three inches long and this is mounted directly behind the front panel on two ¼ inch screws. The main logic board already described is also quite small being 3¼ inches square.

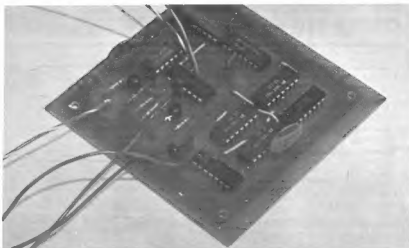
These two boards are shown full size in Figs. 2, 3 and 4 respectively.

Fig. 5 shows the component layout looking at the top of the main logic board and the position of the power leads and the signal leads shown in Fig. 1 are also identified. Also on this figure can be seen the jumper leads which are on the top of the board. In addition it is necessary to make two jumper connections on the underside of the board in order to join the output of one of the hex inverters, pin 6, to the Ro connection, pins 2 and 3, on each of the 7490s which are used in the divide by 46 section.

Apart from a regulated five volt power supply this is all that is needed to provide a digital readout for any transceiver using a VFO generator similar to the one described at the beginning of this article. The simplest way of getting a five volt regulated power supply is to use an LM 309K. The only other component needed is a 0.1 microfarad capacitor at the input to the IC. With a standard heatsink the LM 309K will supply up to 1 amp which is more than enough for both the logic and the display systems. The input to the LM 309K can be anything from about 7 to 20 volts. The higher this input voltage is the more power has to be dissipated by the IC so it is wise to keep the voltage fairly low, say not more than 10 to 12 volts.

In order to operate the logic satisfactorily the 46 MHz input and also the 10 to 10.5 MHz input should be fairly low impedance — about 500 ohms, and the voltage swing should be from about plus 4 volts to something under 0.5 volt in both cases. This voltage swing is fairly critical and under no circumstances should the voltage swing higher than 5 volts or lower than ground potential otherwise the IC and even more importantly, the LED display, could be damaged. This means that it is unwise to take the signal source from any kind of tuned circuit or from any buffer stage which has a rail voltage greater than 5 volts. In most cases a VHF transistor with a suitable resistor in the base, the emitter grounded and the collector connected to the 5 volt rail through a 470 ohm resistor will provide a suitable buffer stage. But this depends of course on the type of circuit which has been used for the 46 MHz oscillator and the VFO.

Both the TIL 306 and the TIL 307 are identical except for the fact that one has a right hand and the other a left hand decimal point. Since there is little purpose in using the decimal point in this applica-



Top view of main logic board.

tion, the decimal point input pins (pins 13) should be grounded to suppress the decimal points and whichever of the LEDs which are most easily available can be used.

The digital readout has been in use for several months and has given excellent results. This, by the way, is in the transceiver constructed by Ron, VK3BDM. Apart from the digital logic boards and a few other bits and pieces the writer's own proposed transceiver hasn't even got off

the ground.

Has anyone some spare time they would like to dispose of? Or maybe some unwanted 72-hour days?

NOTE—The VFO generator would normally be very carefully screened so that only the 56-56.5 MHz frequency would come out to the rest of the transceiver. The main logic board should also be mounted in this screened compartment. It has not been proved necessary to shield the LED display board.



Some of the magnificent old equipment at Burton's Amateur Wireless Museum in Links Ave., Concord, NSW. Inspection is by appointment only by telephoning Harold at 73 2368 (Priv.) or 92 0411 (Bus.).

# An AR Special

## A Review of the ICOM IC22

Over the next few months 'Amateur Radio' will be presenting a series of reviews on a selection of the latest two metre FM transceivers. In advance we would like to thank the various distributors of this gear who have made these reviews possible.

The Icom IC22 is distributed by Malco Electronics of Mount Street, Heidelberg, Victoria. It is one of a wide range of VHF transceivers produced by Icom. Details on all Icom equipment can be obtained from the company.

The IC22 is a fully solid state transceiver designed to operate over any two megahertz section of the two metre band. It employs 23 transistors, 3 FET's, 3 IC's and 16 diodes. There is provision for 22 channels which should take care of future requirements of most operators. As we will later see, the circuitry employs some very interesting features many of which are not to be found in other pieces of contemporary gear. It is also one of the smallest of the currently available FM transceivers measuring only 2-9/32" high, 6-1/8" wide and 8 1/2" deep. The weight is 4 pounds. Construction throughout is in light-weight aluminium with a plastic front panel assembly.

Finish is in black with the metal sections in a fine wrinkle paint and the front panel in a dull non-reflecting surface with matching knobs. To offset this the meter is brightly illuminated with sharp red and green calibrations. The channel selector numbers come up in green, plus red and blue transmit and receive indicators. An excellent mobile mount with a quick release facility is supplied, as is a good quality dynamic microphone. All necessary mounting hardware is included with the set. Transmitter output is rated at ten watts with one watt in the low power position.

Power required is a nominal 13.5 volts DC, and current drain is specified at 2.1 amps on high power transmit, 1.2 amps on low power and receiver 180 mA average.

### IC22 CIRCUIT DESCRIPTION

Now for a closer look at the inside layout and circuitry of the 'black box'. Both transmitter and receiver are constructed on a common printed board with the twenty two crystal channels and their associated trimmers mounted on a separate board. This of course amounts to forty-four actual crystal positions and trimmers.

The receiver is a double conversion superhet with the first IF at 10.7 MHz and the second IF at 455 kHz. Ceramic filters are employed at both IF frequencies to provide a high degree selectivity. A 3SK40 dual gate MOS FET is used as the receive RF amplifier followed with a 2SK37 FET as the first mixer. Between these two stages



are five helical resonators to give a high rejection to strong out-of-band signals and to generally improve cross modulation characteristics. The 455 kHz IF stages use two transistors and one IC to provide a high degree of gain. An IC is also used as the complete audio output section. The receive indicator light glows when the mute is opened either with a signal or by operation of the mute control. With the audio control turned off, this light gives a visual indication of an incoming signal on the selected channel. Receiver frequency control is from a 15 MHz crystal multiplied by nine with two tripler stages. This is then mixed to give the first IF of 10.7 MHz. The DC supply to the receiver goes via an 8 volt series regulator.

One of the interesting features of the IC22 is the use of solid state switching. This is not only for the supply voltage switching but also for the antenna change over. For a while, you might miss hearing the usual snap of the relay as you push the transmit button.

The transmitter section is quite straight forward. Frequency control starts with an 18 MHz crystal oscillator, followed by one buffer stage, a diode phase modulator, then three doubler stages, two more buffers and the final stage. Audio for the transmitter is handled by one IC feeding from the 500 ohm dynamic microphone. The output of the IC feeds to the deviation control via a low pass filter. Between the deviation control and the output transformer is a deviation level selector. By shifting a flying lead connector from one connector post to the other, either wide or narrow deviation may be selected. This is in addition to the normal deviation control. Strangely, this adjustment does not rate a mention of any sort in the otherwise excellent instruction manual. Low power selection is accomplished by switching a 20 ohm 5 watt resistor in series with the supply voltage to the last buffer

and the final stage. The front panel meter switches automatically from 'S' meter on receive to relative output meter on transmit.

### THE IC22 ON THE AIR

The channel selector was difficult to read when the set was in place under a car dash board. There was also a considerable parallax error. To accurately determine which channel was selected, a straight-on view was needed.

This is due to the small size and close spacing of the channel numbers on the selector switch. Receiver audio quality appeared to be much better than is usual with transceivers of this size. This is no doubt due to the use of a 4 inch speaker mounted in bottom of the transceiver cabinet. Provision is also made to plug in an external speaker via a 3.5 mm phone jack at the rear of the cabinet. Actual audio output appeared to be on the low side for noisy situations. This was later confirmed when the audio output was measured. Transmitted audio quality was clean and smooth, however, some reports indicated slightly on the bassy side. Deviation was set to the low position when the set arrived from the agents. This was changed to the high tapping and the deviation control reduced. This appeared to produce the best results.

Operation of the controls apart from the channel selector was excellent. The receive mute control operated with a smooth fading action as distinct from the sudden death action of many solid state sets. Audio gain could be left set at a normal point, with the power on/off switch separate and combined with the high/low power selector.

A useful feature of the IC22 is the ability to net the transmitter frequency to the receiver. After connecting a centre zero meter to the discriminator output which is available on the accessory socket at the rear of the cabinet, a jumper is connected

between two test points on the board. The transmit crystal trimmer is then adjusted for a zero reading on the meter. Obviously this only applies to simplex operation.

#### THE IC22 ON TEST

Transmitter output was measured with a Marconi RF power meter. With a 13 volts DC supply to the IC22, exactly 10 watts output was indicated in the high power position, and .8 watts in the low power position. The final and driver stages were trimmed but output could not be increased. The multiplier stages were not touched.

Receiver sensitivity was next checked using a Marconi FM signal generator. At 5 $\mu$ V, 27dB of quieting was measured with signal to noise ratio at the same input showing 30dB. These are excellent figures. With the mute control set at maximum sensitivity, the receiver opened up at a level of .5 $\mu$ V — 8dB. With the mute hard on, it took only .5 $\mu$ V + 2dB to open the receiver.

The 'S' meter was checked for calibration with the following results.

Meter Reading	Sig. Gen. Setting
0	.5 $\mu$ V
1	1.25 $\mu$ V
5	4.0 $\mu$ V
9	100.0 $\mu$ V

Above 9 on the scale, the increase flattened off with the 9 to 40dB over only showing an increase of 12dB.

Receiver audio power output was measured by feeding the output to a dummy load and measuring the voltage with a VTVM. At the onset of audible distortion, .5 watts was indicated. This is well below the specified 1.5 watts, however this could

be due to the fact that steady tone was used in our test. With speech output, more power could possibly be delivered.

Receiver selectivity was measured with an input of .5 $\mu$ V. At this level, the receiver accepted  $\pm 7$  kHz deviation with low distortion. It was noted though, that at lower inputs, the deviation acceptance decreased somewhat, so that many stations with normal modulation tended to sound slightly distorted. This is caused by the shape factor of the filter used in the 455 kHz IF strip. If required, a better filter can be easily substituted, as the printed board is drilled to accept the top quality Matura ceramic filter.

Current drain was checked with 13.0 volts applied to the set. With full output the receiver drain was 500 milliamps. In the muted off position the drain was 300 milliamps. This is a little higher than the specified 180 milliamps. High power transmit drain was spot on at 2.1 amps.

#### INSTRUCTION MANUAL

In general this is well written with only a very few omissions. Printed circuit board layouts are included, as is the circuit diagram and block layout.

Maintenance, including alignment details, is covered in three short paragraphs.

#### SERVICE FACILITIES

In view of the lack of service information supplied, it must be assumed that most owners will rely on the dealer to provide this. Malco Electronics are well qualified in this area. They hold comprehensive spares and also stocks of crystals for all the popular channels at very reasonable prices.

In conclusion, I would like to acknowledge the help of Peter Linden VK3BX in formulating test figures for the IC22.

VK3OM

#### SPECIFICATIONS

##### GENERAL

Frequency coverage—144.00 to 148.00 MHz or

148.00 to 148.00 MHz

Number of Transistors and Diodes—Transistors 23,

FET 3, IC 3, Diodes 18

Modulation Type—F3

Power Voltage—DC 13.5V plus-minus 15% negative ground

Current Drain—Transmit, HI (10W) average 2.1A,

LOW (1W) average 1.2A

Receiver average—180mA

Antenna input—50 ohms

Size 2.9/32" high x 9-1/8" wide x 5-1/2" depth

Weight—4 lbs.

##### TRANSMITTER

RF Power Output—HI 10W, LOW 1W

Frequency Control—Crystal (16 MHz) multiplied x 8

Maximum Frequency Deviation—Adjustable between

3 to 16 kHz

Audio In.—500 ohms

Modulation System—Variable reactance phase

modulation

Microphone—500 ohms — Dynamic microphone with

push button switch

##### RECEIVER

Reception Frequencies—22 channels for 2 meter

band

Reception System—Double Superheterodyne

Intermediate Frequencies—1st Intermediate, 10.7

MHz, 2nd Intermediate, 455 kHz

Sensitivity—s Better than 0.4  $\mu$ V 20 dB quieting,

s 5 plus N/N at 1  $\mu$ V input, 30 dB or more

First IF—10.7 MHz

Second IF—455 kHz

Spurious Responses—minus 80 dB

Spurious Gain—minus 60 dB, or less

Squelch—Adjustable 5 to minus 15 dB

Band width—plus-minus 3 kHz/minus 8 dB point,

plus-minus 15 kHz/50 dB

Audio Output Power—15W

Audio Output Impedance—8 ohms

Frequency Control—Crystal (14 MHz) multiplied x 8

## HIGH RISE ANTENNA

Living in a large block of home units can certainly have problems for the Radio Amateur wishing to boost his signal with a beam antenna.

antenna

Eric VK2BEK, has solved this problem nicely. He resides in a 13 storey block of units in Elizabeth Bay, N.S.W., and was given permission by the owners to erect an antenna on the roof. The proviso being that the structure of the building was not interfered with, and no TVI was caused.

The photograph on the front cover and those attached show how this was done efficiently and at moderate cost.

He obtained from a plumber, a base supporting 'cross', into which 4 pipes are screwed at right angles. A flange was welded to the base to hold a 1 1/2 inch diameter mast.

Into the cross were screwed 4 pieces of 1 inch (inside diameter) pipe 5 feet long. The vertical mast is 12 feet high including the rotator, and is screwed into the flange.

Concrete blocks, each 1 cubic foot and weighing approximately 100 lbs. were made with a groove in one side to fit over the base pipes.

Guy wires are run from the concrete blocks to the rotator, and the whole assembly is extremely rigid. Eric is confident that the strongest winds in the area will not tip the antenna over.



Eric W. Bierre VK2BEK

80 Wallis Street, Woolahra, N.S.W., 2025

The beam is a Hy-Gain TH3 Junior, and behind it can be seen an 18AVT which is used for 40 and 80 metres.

It all works very well, and thanks to a low pass filter and antenna tuning unit, there have been no complaints of TVI.

Eric suggests that other high rise home unit or flat dwellers could obtain permission for a similar structure.

# Telecommand and Telemetry of the Oscar 6 and 7 Communications Satellites Part 3

David Hull, VK3ZDH  
Project Australia

This is the concluding part of the 3 part series on the telecommand and telemetry of OSCAR 6 and 7. It deals with the telemetry systems.

## TELEMETRY MORSE CODE (OSCAR 6 & 7)

### RTTY (OSCAR 7)

#### 1. MORSE CODE, TELEMETRY

The system of telemetry was developed for Oscar 6 and will be used as an alternative to the RTTY telemetry on Oscar 7. The design and development of these units has been covered extensively in published papers — see references — and will be summarised on a block diagram is shown in Figure 3.

The analog data to be transmitted is selected and converted to two decades of digital information. After analog to digital conversion the digital word is converted into morse code and used to key the carrier of the telemetry transmitter in the following format.

#### Sample frame of Morse Code Telemetry

HI	180	191	199	190
	296	296	295	251
	363	373	369	336
	437	428	437	435
	536	520	530	544
	600	643	650	HI

The morse letters HI identify the beginning and end of the telemetry frame and also serve as an official

cell sign (by permission of the FCC). The last two figures are converted to the appropriate calibration data by multiplying the decoded number by the channel factor. The data for Oscar 6 is shown in Fig 4.

### 2. RTTY TELEMETRY

This system of telemetry was developed by Australia and will be shown on Oscar 8. The data will be transmitted at 45.5 baud with 850 Hz shift page print out and much higher data rate transmission has led to the expansion of the number of parameters covered. A block diagram of the system is shown in Fig 5 with conversion tables shown in Fig 7.

Each data word again begins with its channel

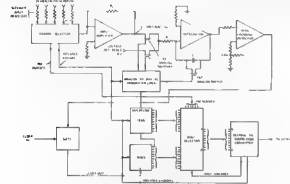


FIGURE 3 OSCAR 6 MORSE CODE TELEMETRY SYSTEM

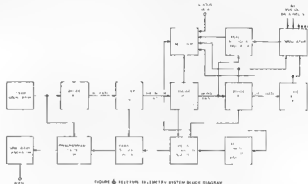
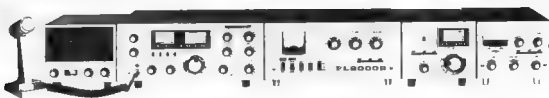


FIGURE 4 OSCAR 6 TELEMETRY SYSTEM BLOCK DIAGRAM

## OSCAR DATA TO BE TELEMETERED BY THE MORSE CODE TELEMETRY SYSTEM

Chan.	Parameter	Unit	Parameter Range	Final Calibration Data/Comments N = Value telemetered (omit first digit which identifies the data line number)	Transmitted Format (Read left to right)
1A	Total Array	I (mA)	0 to 500 mA.	$I_T = 5.00 N$ (mA.)	1A 1B 1C 1D
1B	+X Solar Panel	I (mA)	0 to 100 mA.	$I_X = 1.00 N$ (mA.)	2A 2B 2C 2D
1C	-X Solar Panel	I (mA)	0 to 100 mA.	$I_X = 1.00 N$ (mA.)	3A 3B 3C 3D
1D	+Y Solar Panel	I (mA)	0 to 200 mA.	$I_Y = 2.00 N$ (mA.)	4A 4B 4C 4D
2A	-Y Solar Panel	I (mA)	0 to 194 mA.	$I_Y = 1.94 N$ (mA.)	5A 5B 5C 5D
2B	+Z Solar Panel	I (mA)	0 to 370 mA.	$I_Z = 3.72 N$ (mA.)	6A 6B 6C 6D
2C	-Z Solar Panel	I (mA)	0 to 370 mA.	$I_Z = 3.68 N$ (mA.)	
2D	Bat. Charge or Discharge	I (mA)	-500 to +500 mA.	BAT = 10.00 N - 500 (mA.) Battery charge or discharge current	
3A	Unregulated Bus	V	12.4 to 30V	$V_{BUS} = 0.174 N + 12.4$ (volts)	
3B	Battery	V	0 to 15V	$V_{BAT} = 0.161 N$ (volts)	
3C	Switching Reg.	V	0 to 15V	$V_{SR} = 0.147 N$ (volts)	
3D	Battery Temp	°C	-30 to +50°C	BAT = -1.471 N + 95.79 (°C)	
4A	Baseplate Temp.	°C	-30 to +50°C	$T_{BP} = -1.471 N + 95.79$ (°C)	
4B	Transponder P.A. Temp.	°C	-30 to +50°C	$T_{PA} = -1.471 N + 95.79$ (°C)	
4C	+X Panel Temp.	°C	-30 to +50°C	$T_{X+} = -1.471 N + 95.79$ (°C)	
4D	+Y Panel Temp.	°C	-30 to +50°C	$T_{Y+} = -1.471 N + 95.79$ (°C)	
5A	+Z Panel Temp.	°C	-30 to +50°C	$T_{Z+} = -1.471 N + 95.79$ (°C)	
5B	Transp. P.A. Emitter	I (mA)	0 to 500 mA.	$I_{PA} = 5.00 N$ (mA)	
5C	Transp. Sw. Reg.	V	0 to 30V	$V_{T.S.R.} = 0.30 N$ (volts)	
5D	Instr. Sw. Reg.	I (mA)	3.8 to 63.8 mA	$I_{I.S.R.} = 0.601 N + 3.80$ (mA)	
6A	Transponder R.F. Power	mW	0 to 10W	$P_{OUT} = 1.0 (N)^2$ (mW)	
6B	Beacon R.F. Power (435.1 MHz)	mW	0 to 1W	$P_{OUT} = 0.10 (N)^2$ (mW)	
6C	Transponder AGC	V	0 to 3V	$V_{AGC} = 0.03 N$ (volts)	
6D	Midrange Cal.	V	0 to 1V	$N = 50$ counts $\pm 1$	

Figure 4 OSCAR 6 Morse code telemetry



**FT-401 TRANSCEIVER:** SSB, AM & CW, 80/10 Mx, PA two x 6J56C, 560 W peak input SSB. Full coverage on 10 Mx, WWV, two auxiliary (blank) ranges, PTT, VOX, RTT, Cal., fan, noise blanker, \$595.

**FT-101B TRANSCEIVER:** 160/10mx, SSB, AM, CW, PA two x 6J56C, 300w. peak input SSB. Built-in dual AC/DC power supply. Low current drain transistorised except for transmitter driver and PA. I.F. noise blanker, fan, FET receiver RF, clarifier, built-in speaker ideal for portable/mobile from 12v. DC, or in the shack on AC, \$599.

**FT-201 TRANSCEIVER:** 80/10 Mx, similar basic features, power and appearance to FT-101B, at lower cost, 230 V AC \$499.

**FT-200 TRANSCEIVER:** 80/10 mx, PA two x 6J56C, 300w. peak input SSB. Manual, PTT or VOX control, offset tuning, calibrator. Operates from a separate power supply. *Real value at \$351.* **FP-200:** Yaesu AC Power Supply for FT-200, in matching cabinet with in-built speaker, \$95.

**FT-75B TRANSCEIVER:** SSB and CW. VXO, noise blanker, squelch. Very small size, transistorised, a superb little rig 80 W PEP. Microphone and five crystals included, \$258.

**FP-75B AC POWER SUPPLY:** 230v., for FT-75B Built-in speaker, power cable and plug, \$88.

**DC-75B DC POWER SUPPLY:** 12v., for FT-75B. Includes built-in speaker, mobile mount, power cable and plug, \$94.

**FL-101 TRANSMITTER:** Solid state 160 - 10 m. PA two 6J56C, all facilities. Companion unit to FR-101, \$499.

**FR-101D RECEIVER:** All solid state, 23 bands inc. all amateur bands 160/10m plus 6 & 2m, FM, CW, etc. etc. \$675.

**FR-101B RECEIVER:** Economy version of FR-101D. Amateur bands only 160/10 Mx and less other options, \$539.

**FT-501 DIGITAL READ-OUT TRANSCEIVER:** 80-10mx, SSB CW. 500w peak input, includes 2-speed cooling fan, noise blanker, clarifier, VOX and etc. Inc. matching AC PS, \$850.

**FL-2000B LINEAR AMPLIFIER:** 80-10 mx. Tubes, two x 572B triodes in G.G., twin fan cooled, \$429.

**FL-2100B LINEAR AMPLIFIER:** Similar to FL-2000B but styled to match FT-101B, \$429.

**FT-420 SIX METRE 660 AM, CW, TRANSCEIVER:** 10w solid state, \$395.

**FT-420 TWO METRE 14.1MHz TRANSCEIVER:** 10 W solid state Simplex, repeater, reverse repeater & priority channel facilities, \$438.

**FTV-450 SIX METRE TRANSVERTER:** Converts 28 MHz SSB to VHF, and includes receiving converter. Primarily designed for coupling with Yaesu transmitters and transceivers, \$195.

**FT-224 TWO METRE FM TRANSCEIVER:** 10 W, 23 channels, PLUS one priority channel. Includes 8, 60, and four repeater channels, installed, \$299.

**FT-2400 FM TRANSCEIVER:** Similar to FT-2FB but with addition of automatic scanning facility, etc., \$385.

**YC-355D FREQUENCY COUNTER:** 200 MHz, \$335.

**YC-355:** Similar to YC-355D but reads to 30 MHz, \$288.

**YO-100 MONITORSCOPE:** Matches other Yaesu Equipment, Inc. IF for 180 kHz. (IF kits for 455 kHz and 9 MHz optional extra), \$179.

**FT-500X three-section LOW PASS FILTER** for TVI reduction, \$24.

**MATCHING EXTERNAL SPEAKERS** for FT-401, FT-101B, FT-201, FR-101, \$32.50.

**MATCHING VFOs:** FV-401, FV-101B, FV-200, each \$120. FV-50C (for FT-75B), \$65.00.

**YD-844 DESK MICROPHONE:** Yaesu De Luxe PTT Dynamic type with stand. PTT switch, and PTT is actuated when lifted from deck, \$39.50.

**Hand-held PTT DYNAMIC MICROPHONE, \$18.50.**  
**VC-75 VOICE CONTROLLER:** Speech compressor with VOX unit included. With lead and connectors to suit FT-75 and FT-620, \$53.80.

As the sole authorized Yaesu agent for Australia, we provide pre-sales checking of sets, after-sales service, spares availability and 90 day warranty.  
Quota type & S/N of set when ordering spares. All prices include sales tax. Freight is extra. Prices and specifications subject to change without notice.

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12AVQ, 10m, thru 20m. trap Vertical	...	\$45
18V 10m, thru 80m. base loaded Vertical	...	\$29.50

**HF MOBILE WHIPS AND FITTINGS****HY-GAIN 'HAM-CAT' SERIES**

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MC-40, 40m	\$23	MC-11, 11m			\$15.50
MC-20, 20m	\$21.50	MC-10, 10m			\$15.50

**YAESU**

RS Series Gutter Mount HF Centre Loaded Mobile Antennas, consisting of gutter mounting base attachment and mast with 118" co-ax and plug PL-250 attached (base mast doubles as a 1/4 wave vertical on 2 Mx) and interchangeable coils with adjustable tip rods for 40 Mx to 10 Mx. 150 watt PEP, 4'6" total length. Slim and neat, brushed chrome finish, a typical Yaesu quality product. RS base and mast, \$19.50. Coils RSL-7, \$19.50, RSL-14, \$18.50, RSL-21, \$21.50, RSL-28, \$14.

**ASAHI**

AS-303A HF Mobile Antenna set, centre loaded type 3.5-28 MHz, 400 W PEP, consists of common mast 4'6", telescoping to 26" for convenient stowage, five interchangeable loading coils with tip rods, and adjusting spanners inc, making a total height of approx. 7', with HD spring and ball mount. Beautifully engineered, leads direct with 50 ohm co-ax. The complete set a steal at \$100.

AS-NK matching SS Bumper Mount Adapter, for AS303A \$12.

**MARK MOBILE****Holcat:**

HW-160, 160m, 6ft.	\$48.00	HW-15, 15m, 4ft.	\$20.00
HW-80, 80m, 6ft.	\$28.00	HW-11, 11m, 4ft.	\$20.00
HW-40, 40m, 6ft.	\$23.50	HW-11, 11m, 6ft.	\$21.50
HW-20, 20m, 6ft.	\$21.50	HW-10, 10m, 4ft.	\$20.00

**FITTINGS:** (Suit all makes).

BPR, bumper mount	...	\$14
BDYF, heavy duty adjustable body mount	...	\$14
HWM-1, fixed body mount	...	\$13
SPG, heavy duty spring	...	\$11
SPGM, light duty miniature spring	...	\$8
JMS "Jitty" body mount	...	\$10
Asahi AS-KRS, flat roof mounting adapter for vertical trap antennas	...	\$15
C30-32 Ball Mount & Spring	...	\$16

**VHF ANTENNAS****UHF ANTENNAS**

23, 3-element 2m Beam	...	\$16.50
28, 6-element 2m Beam	...	\$38.00
215 15-element 2m super-beam	...	\$64.00
SGP-2, 2 m ground-plane	...	\$16.00
PG-2, 2m 1/4 wave ground-plane	...	\$27.50
64B 4-element 6m beam	...	\$41.50
66B 6-element 6m beam	...	\$55.00

**CUSH CRAFT**

ARX-2K Extension kit, converts your old model AR-2 to three half wave vertical	...	\$13.00
ARX-2 New version of the AR-2 Ringo 2m three half wave 6dB gamma loop matched vertical	...	\$36.00
ARX-450, 435-450 MHz three half wave 6dB Ringo	...	\$35.00
AR-6, 6m 1/4 wave Ringo 3.75 dB	...	\$35.00
CR-1, 11m 1/4 wave Ringo 3.75 dB	...	\$38.00
A144-7, 7-element 2m Beam	...	\$23.50
A144-11, 11-element 2m Beam	...	\$32.50
A144-20T, 20-element 2m "Twist" Beam	...	\$65.00
A50-3, 3-element 6m Beam	...	\$33.00
A50-5, 5-element 6m Beam	...	\$32.00
A50-11, 11-element 430 MHz Beam	...	\$22.00

**VHF MOBILE ANTENNAS****HY-GAIN**

MAG-150, magnetic mount 1/4-wave whip (108 thru 450 MHz) includes 18 ft. of RG59 and connector	...	\$26.00
270 Double stacked 1/4-wave fiberglass whip for 2m W-102, 102" SS whip suitable 27-100 MHz	...	\$15.50
HMB4, telescoping mast for halo, and etc.	...	\$13.50

**ASAHI**

AS-2HR, 1/4-wave SS 2m gutter mount, inc. co-ax.	...	\$32.00
AS-2HRG, as above, but fibreglass whip	...	\$34.00
AS-2HRF, 1/4-wave cowi mount type	...	\$36.00
AS-6RD 6m centre loaded SS whip, with gutter mount	...	\$22.50

**NEWTRONICS**

UHG-1, 1/4-wave 2m gutter mount, inc. co-ax.	...	\$17.50
--	-----	---------

**ELECTRONIC SERVICES**

68 Shannon St., Box Hill North, Vic., 3129.

Ph. 89-2213

OLD: MURPHY (C) 1978	Ph. 57 8008
M.S.V. STEPHEN KILN, P.O. Box 26, Mordialloc	Ph. 607 1658
	Ph. 607 1645
S.A. FARMERS RADIO PTY. LTD. 257 Angus Street, Adelaide 5001	Ph. 23 1268
W.A. H. R. PROSE 26 Lockhart Street, Perth 6152	Ph. 60 4379

## BALUNS

**A & R**  
25, 75 and 300 ohm, 400W **\$15.00**

**KW ELECTRONICS**  
KW Balun, 1:1, for 50 or 75 ohms, screw terminals, 1kW **\$13.50**

**HY GAIN**  
BN-85, broad-band ferrite Balun, 2 kW for Beams and Doublets **\$24.00**  
BN-27A as above especially for 11m CB band **\$22.00**

## ROTATORS

**HY GAIN**  
333 Rotator, for the big beams and stacked arrays, 110 V AC **\$280**

**CDR**  
Ham II, 230 V AC **\$175**  
CD-44 Medium duty rotator, 230 V **\$112**  
AR-22L Light, low cost rotator, 230 V **\$60**  
Cable & Conductor for Ham II CD-44 **75 cents yd.**

## ANTENNA ACCESSORIES

**HY GAIN**  
LA-1, Lightning Arrestor, for installation in standard 52 or 72 co-axial feedline, designed to MR. specs. **\$30.00**  
LA-2, smaller size co-ax arrestor **\$2.75**  
C1, Centre Insulator, for Doublets **\$16.00**  
421A, Power meter, 3-50 MHz, reads SWR, power on 10, 100 & 500 W scales, and AM modulation percentage. Especially made for Novice & Marine 11m use **\$48.00**  
478 TVI filter, attenuation begins at 41 MHz and is 25 dB down at 54 MHz, 50-238 connectors **\$15.00**

**Q CRAFT**  
Porcelain Egg Insulators **17 cents**  
Wide Range of Co-axial cable and connectors in stock.

**KW ELECTRONICS**  
Multi-band dipole traps with ceramic "T" centre insulator, 80-10m bands per pair complete with insulator **\$24.00**  
Co-axial cable switch, 3 positions **\$18.00**

**E & W**  
Co-axial cable switches, 5 position, Model 550G **\$24.00**

## SWR METERS AND DUMMY LOADS

**Q CRAFT**  
SWF3-3, single meter type, combined SWR and FS meter, 50 ohms, inc. FS pick-up whip, size 6" x 2" x 2 1/4"  
3-150 MHz UHF connectors **\$15.00**  
SWR-2, dual meters, 50 ohms. Simultaneous reading of forward and reflected power, 5" x 2" x 2 1/4"  
3-150 MHz UHF connectors **\$22.00**

**OSKER**  
SWR-200 large dual meters, switched 50-75 ohms, with calibration chart for direct power readings to 2 kW in three ranges. A very elegant instrument.  
7 1/2" x 2 1/4" x 3 1/4" **\$42.00**

**KW ELECTRONICS**  
2 Match Antenna Couplers, 50 metres to 10 metres. Beautifully finished in communication grey (see review "QST" July, 1972).

**KW E-Zee Match**, screw terminals at rear, size 5 1/2" x 6" x 12" **\$64.50**

**KW-107 Supermatch**, as above but with addition of SWR meter, power meter with large 50 ohm dummy load to read up to 1 kW PEP, UHF sockets at rear. A superb piece of equipment, 7" x 8" x 13" **\$178**

**KW-100 "L"** network single wire or co-ax. feed coupler especially for 160m. Also usable on 80 & 40 **\$52.00**

**KW-103 SWR Power Meter** uses toroidal coil pick-up for continuous operation 52 ohms 1 kW max. to 30 MHz SO239 UHF sockets **\$45.00**

**KW Dummy Load** 52 ohm Air Cooled. Will handle up to 1 kW (ideal for use in the workshop or field) **\$29.00**

**HEATEE KIT**  
HM31 Cables KM 1 kW oil cooled (oil not included) **\$25.00**

**HY GAIN**  
580. A 5 watt dummy load mounted in a PL-259 connector **\$2.25**

## OTHER ACCESSORIES

**KATSUMI**  
AT-3 RF activated CW Monitor and Code Practice Audio Osc. uses 4 transistors, 2 diodes, with built-in speaker and tone control. Requires one UM3 penlite cell. In grey metal case, 2" x 3 1/4" x 3 1/4" **\$16.00**

**EXM-1 Audio Morse CP Osc** with speaker, one transistor. Headphone socket and tone control, requires one UM3 cell, in black metal case 3 1/4" x 3 1/4" x 1 1/4" **\$8.50**

**AT-8 Audio Osc.** larger de luxe type CP Audio Osc., 3 transistors. Includes relay for transmitter keying if required, and headphone socket. Tone and volume controls. Plenty of volume, suitable for group practice or tests. Nicely finished brown metal cabinet, 3 1/4" x 5 1/2" x 5". Requires four UM3 cells **\$30.00**

**MC-701 Mic.** Compressor, battery operated. Available with 4 pin or TRS mic. connector, improved model **\$45.00**

**KW**  
Monitorscope Model **KW105** uses 3" square face CRO tube, includes built-in 2 tone test oscillator, sweep generator and AC power supply. Convenient co-ax connectors at rear. A must for the proper adjustment and continuous monitoring to keep your SSB equipment operating at its maximum efficiency **\$245**

## MORSE KEYS

**KATSUMI**  
MK-1 Light weight Morse Key suitable for practice or transmitter use **\$1.50**

**IK-100 Electronic keyer**, super quality, IC with dot memory. Built-in monitor & paddle. Solid state "relay", 230 V AC & 12 V DC types **\$69.50**

**HI-MOUNT**  
HK-701 De luxe heavy duty morse key. Heavy base. A really beautifully constructed and finished unit. Fitted with a dust cover, standard knob and knob plate **\$111.00**

**SK-701 Side Swiper** key to actuate Electronic keyer **\$24.50**  
**SK-100 (BUG)** Semi-automatic bug key, full adjustable **\$29.50**

Also available: Equipment for novice, CB and Marine use on 11m band. Antennas, beams, Walkie Talkies, base stations, and accessories. Digital clocks, Barlow-Wedley receivers, Digital Clock GC/FM radios, Automatic VHF/UHF scanning receivers, SSTV, Generator noise filters

**Servicing facilities for all types of Amateur and Novice equipment. We check all sets before sale and provide a 90 day warranty.**

All prices Incl. S.T. Postage and freight extra. Prices and specifications subject to change without notice. Availability depends on stock position at time of ordering

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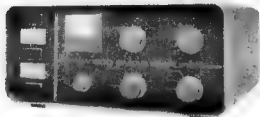
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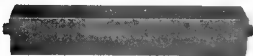
**KW2000E** 160-10m SSB-CW transceiver, 180 W, PA 2 x 6146. Mechanical filter, Calibrator, VOX, PTT, IRT/ITT/IRTT, ALG. Beautiful construction and appearance, excellent audio quality. Price, incl. PS **\$635.00**



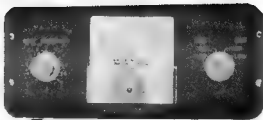
**KW1000** Linear Amplifier, 80-10m, 2 x 572B/T160L in GG circuit. Fan cooled. Panel meter indicates plate volts, current, and SWR. Matches KW equipment, and is compatible with other equipment. **\$440**



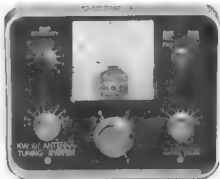
**KW-108 MONITORSCOPE**, connects in antenna line for visually monitoring your transmission. Includes built-in two tone oscillator. **\$245**



**KW LOW PASS FILTER**, for TVI reduction. A very effective 5 section filter, with attenuation in excess of 80 db. Fitted with SO-239 UHF sockets. **\$29.50**



**KW-103** SWR/power meter, toroidal pick-up type for accuracy and reliability, 0-30 MHz. A quality unit. **\$45**



**KW-107 SUPERMATCH**, an all in one unit, combines an E-ZEE match, Antenna switch, Dummy Load and SWR/PWR meter for balanced or coaxial feeds. Wide impedance matching range at up to 1KW PEP. **\$18.50**

**KW ANTENNA Switch**, 3 position co-ax switch with UHF type lefton connectors, usable up to 500 MHz, 1 KW PEP, cross-talk better than -50db. **\$18.50**



**KW E-ZEE MATCH**, an efficient coupling unit of the Z match type for use from 80 to 10 metres over a wide impedance range. For use with balanced or coaxial feed lines. **\$64.50**

**KW MULTIBAND** antenna traps. Comprises two special trap coils, ceramic centre "T" insulator and instructions for a 108 ft. 80-10m dipole, using co-ax or twin 70 ohm feeder. **\$24**

**KW-160**, an "L" network coupler especially for 160m, can also be used right through 80 & 40 for single wire or co-ax feed. Similar size and appearance to the E-ZEE. **\$52.80**

**KW BALUN**, 1:1, for 50 or 75 ohms, screw terminals, 1 KW. Ideal for dipole use, lightweight & waterproof. **\$13.50**

**KW DUMMY LOAD**, air cooled, up to 1 KW, 0-70 MHz, 52 and 75 ohm. **\$20.00**



**ELECTRONIC SERVICES**

88 Shannon St., Box Hill North, Vic., 3129.

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OLD MICRELL RADIO CO. (50 Amps) Radio, 1950s  
STEPHEN KIRK, P.O. Box 58, Macquarie, NSW

Ph. 47 6238  
Ph. Day 667 1948  
RCH, 371 5445

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W.A. H. KROEGER, 26 Latham Street, Perth 6000

Ph. 23 1256  
Ph. 36 2319



Figure 7.

## AMSAT-OSCAR 7 TELETYPE TELEMETRY SYSTEM

Channel No. XX Measurement 123

Channel	Measured Parameter	Measurement Range	Preliminary Calibration Equation
00	PA Temp. - 70/2 Rptr.	-30° to +50°C.	$T_2 = 95.79 - 0.1471 H (^{\circ}\text{C})$
01	+X Solar Panel Current	0 to 2000 mA.	$I_{+X} = 2000 - 2 H (\text{mA})$
02	+Y Solar Panel Current	0 to 2000 mA.	$I_{+Y} = 2000 - 2 H (\text{mA})$
03	-X Solar Panel Current	0 to 2000 mA.	$I_{-X} = 2000 - 2 H (\text{mA})$
04	-Y Solar Panel Current	0 to 2000 mA.	$I_{-Y} = 2000 - 2 H (\text{mA})$
05	+S Axis Orientation	0 to 90°	$\theta_{+S} = \arccos (H/H_{\text{MAX}}) (\text{deg. from Saxis})$
06	+X Solar Panel Current	0 to 2000°	$I_{+X} = 2000 - 2 H (\text{mA})$
07	+Y Solar Panel Current	0 to 2000 mA.	$I_{+Y} = 2000 - 2 H (\text{mA})$
08	-X Solar Panel Current	0 to 2000 mA.	$I_{-X} = 2000 - 2 H (\text{mA})$
09	-Y Solar Panel Current	0 to 2000 mA.	$I_{-Y} = 2000 - 2 H (\text{mA})$
10	-S Axis Orientation	0 to 90°	$\theta_{-S} = \arccos (H/H_{\text{MAX}}) (\text{deg. from Saxis})$
11	Battery Voltage	6.4 to 16.4 V.	$V_B = 0.01 H + 6.4 (\text{volts})$
12	Half-Battery Voltage	0 to 10 V.	$V_{HB} = 0.01 H (\text{volts})$
13	28V. Regulator Voltage	0 to 34 V.	$V_{28} = 0.034 H (\text{volts})$
14	10V. Regulator Voltage	0 to 15 V.	$V_{10} = 0.015 H (\text{volts})$
15	9V. Regulator Voltage	0 to 10 V.	$V_9 = 0.01 H (\text{volts})$
16	Bat. Charge Reg. #1 Vg.	0 to 10 V.	$V_{g1} = 0.01 H (\text{volts})$
17	Bat. Charge Reg. #2 Vg.	0 to 10 V.	$V_{g2} = 0.01 H (\text{volts})$
18	Ground-Zero Telemetry Cal.	0 V	$V_0 = 0.00 (\text{volts}); H/Q_0^2 \pm \text{count}$
19	Total Solar Panel Current	0 to 3000 mA.	$I_2 = 3 H (\text{mA})$
20	Bat. Charge-Discharge Curr.	-2000 to +2000 mA.	$I_B = 4 H - 2000 (\text{mA})$
21	+X Solar Panel Current	0 to 2000 mA.	$I_{+X} = 2000 - 2 H (\text{mA})$
22	+Y Solar Panel Current	0 to 2000 mA.	$I_{+Y} = 2000 - 2 H (\text{mA})$
23	-X Solar Panel Current	0 to 2000 mA.	$I_{-X} = 2000 - 2 H (\text{mA})$
24	-Y Solar Panel Current	0 to 2000 mA.	$I_{-Y} = 2000 - 2 H (\text{mA})$
25	+S Axis Orientation	0 to 90°	$\theta_{+S} = \arccos (H/H_{\text{MAX}}) (\text{deg. from Saxis})$
26	+X Solar Panel Current	0 to 2000 mA.	$I_{+X} = 2000 - 2 H (\text{mA})$
27	+Y Solar Panel Current	0 to 2000 mA.	$I_{+Y} = 2000 - 2 H (\text{mA})$
28	-X Solar Panel Current	0 to 2000 mA.	$I_{-X} = 2000 - 2 H (\text{mA})$
29	-Y Solar Panel Current	0 to 2000 mA.	$I_{-Y} = 2000 - 2 H (\text{mA})$
30	-S Axis Orientation	0 to 90°	$\theta_{-S} = \arccos (H/H_{\text{MAX}}) (\text{deg. from Saxis})$
31	RF Per. Out - 2/10 Rptr.	0 to 10,000 mW.	$P_{2/10} = (H/10)^2 (\text{milliwatts})$
32	RF Per. Out - 70/2 Rptr.	0 to 14 watts	$P_{70/2} = 14 (1-0.001 H)^2 (\text{watts})$
33	RF Per. Out - 435 Beacon	0 to 1000 mW.	$P_{435} = 0.001 H^2 (\text{milliwatts})$
34	RF Per. Out - 2304 Beacon	0 to 1000 mW.	$P_{2304} = 0.001 H^2 (\text{milliwatts})$
35	Battery Temperature	-30° to +50°C.	$T_{\text{Bat}} = 95.79 - 0.1471 H (^{\circ}\text{C})$
36	Baseplate Temperature	-30° to +50°C.	$T_{\text{BP}} = 95.79 - 0.1471 H (^{\circ}\text{C})$
37	+X Facet Temperature	-30° to +50°C.	$T_{+X} = 95.79 - 0.1471 H (^{\circ}\text{C})$
38	+S Facet Temperature	-30° to +50°C.	$T_{+S} = 95.79 - 0.1471 H (^{\circ}\text{C})$
39	2304 Beacon Temperature	-30° to +50° C.	$T_{2304} = 95.79 - 0.1471 H (^{\circ}\text{C})$
40	Midrange Telemetry Calibr.	2,500 $\pm$ 0.001 V.	$H = 500 \pm 1 \text{ counts}$
41	+X Solar Panel Current	0 to 2000 mA.	$I_{+X} = 2000 - 2 H (\text{mA})$
42	+Y Solar Panel Current	0 to 2000 mA.	$I_{+Y} = 2000 - 2 H (\text{mA})$
43	-X Solar Panel Current	0 to 2000 mA.	$I_{-X} = 2000 - 2 H (\text{mA})$
44	-Y Solar Panel Current	0 to 2000 mA.	$I_{-Y} = 2000 - 2 H (\text{mA})$
45	+S Axis Orientation	0 to 90°	$\theta_{+S} = \arccos (H/H_{\text{MAX}}) (\text{deg. from Saxis})$
46	+X Solar Panel Current	0 to 2000 mA.	$I_{+X} = 2000 - 2 H (\text{mA})$
47	+Y Solar Panel Current	0 to 2000 mA.	$I_{+Y} = 2000 - 2 H (\text{mA})$
48	-X Solar Panel Current	0 to 2000 mA.	$I_{-X} = 2000 - 2 H (\text{mA})$
49	-Y Solar Panel Current	0 to 2000 mA.	$I_{-Y} = 2000 - 2 H (\text{mA})$
50	-S Axis Orientation	0 to 90°	$\theta_{-S} = \arccos (H/H_{\text{MAX}}) (\text{deg. from Saxis})$
51	Battery Voltage	6.4 to 16.4 V.	$V_B = 0.01 H + 6.4 (\text{volts})$
52	Half-Battery Voltage	0 to 10 V.	$V_{HB} = 0.01 H (\text{volts})$
53	AGC Level - 2/10 Rptr.	0 to 27 dB	$\text{AGC} = 10 \log_{10} (H - 500) (\text{dB})$
54	TX Dec. Test Pt.-70/2 Rptr.	0 to 100%	$\text{TX} = 0.10 H (\text{percent})$
55	RX Dec. Test Pt.-70/2 Rptr.	0 to 100%	$\text{RX} = 0.10 H (\text{percent})$
56	Modulator Out. - 70/2 Rptr.	0 to 10 V.	$\text{MOD} = 0.01 H (\text{volts})$
57	Envelope Test Pt.-70/2 Rptr.	0 to 10 V.	$\text{ENV} = 0.01 H (\text{volts})$
58	AGC Level - 2/10 Rptr.	0 to 27 dB	$\text{AGC} = 10 \log_{10} (H - 500) (\text{dB})$
59	CONV Dec. Test Pt. - 70/2 Rptr.	0 to 10 V.	$\text{CONV} = 0.01 H (\text{volts})$

number followed by the measurement. The frame begins with two identical lines of status information about the satellite sub systems and includes an indication of the last command received by the satellite. This is used to verify command acceptance and as a cross check for other command stations. In addition to the continuous page style of printout the encoder will continuously telemeter any one channel and may be stopped from one channel to the next. These functions are available upon command.

## SUMMARY:

The successful command of Radio Satellites by amateurs was first demonstrated with the Australian built Oscar 5. Oscar 6 has already exceeded its design life by 50 per cent and this is due in no small part to the success of the command network, the command system and to the ability to monitor the satellite sub-systems through the telemetry read outs. The author would like to acknowledge and thank Mr. Larry Kayser VE3QB and Dr. Perry Klein K3JTE of AMSAT for permission to quote part of their papers on command and telemetry. Thanks are also due to Mr. Robert Willis VK3SF of the Melbourne University Astronautical Society and the Astronautical Society of Australia for computer times and programmes, and Mr. John Nott, VK3ZQN for help with Radio frequency and Antenna hardware.

## REFERENCES:

- (1) "SMART-SYSTEM MULTIPLYING AMATEUR RADIO TELECOMMANDS". By L. Kayser VE3QB. Presented to the ARRL Technical symposium on Space Communications Session, Virginia, USA, September, 1975.
- (2) "Spacecraft Telemetry Systems for the developing Nations". By P. Klein, J. Goode, P. Hamner and D. Bellair. Presented to the IRE National Telemetry conference, April, 1971.

## OVERSEAS PUBLICATIONS SUBSCRIPTIONS

- Inflation and new exchange rates. "Rapid inflation", says the editorial in QST for Sept. '74, "the past couple of years has had a severe impact on ARRL's budget".

- The following are the latest 1975 subscription rates which supersede all previous advices (including that on p.25 of October AR) —

\$A	1 year	2 years	3 years
Mem Radio	6.25	10.50	15.00
CQ	6.50	11.00	14.50
QST	8.50	17.00	25.50
Break-in*	4.20	—	—
73	7.00	—	13.50

Radio Communication†	8.80	—	—
VHF Communications*	4.00	—	Surface
	6.20	—	Air Mail
CQ-TV	2.35	—	—

\*Present rates.

†Please ask for membership form.

- Write for these and details of other items to:

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P.O. BOX 150  
TOORAK, VIC. 3142

- Remember these as splendid Christmas presents

## Commercial Kinks

with Ron Fisher VK3OM

3 Fairview Ave., Glen Waverley, 2150

**INCREASED OUTPUT FOR THE FT200**  
Dave Smithdale VK6DX reports on a simple modification on the final of the FT200 to increase output particularly on the higher bands.

"Anyone who has an FT200 should give away that nasty wirewound shunt in the cathode of the finals, and replace it with a good carbon resistor. The results are amazing, I am getting 125 watts out into a dummy load on 28 MHz after this modification. Prior to this the maximum was about 80 watts. The original shunt varies considerably with temperature."

It is also possible that the wirewound shunt has a fair degree of inductance putting the final cathodes well above earth. Whatever, Dave's modification appears to be very worth while.

### METER ACTION ON THE FT200

Some time ago in this column, it was suggested that the meter action on the FT200 could be slowed down to give more accurate 'S' readings. K. Moore VK4IJ takes this one stage further.

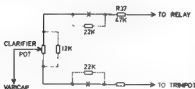
"A previous article in AR suggested a 1000 Mfd. capacitor across the S meter. I tried this and while it was a great improvement on receive, I did not like the action on transmit and felt it was not showing the true plate current peaks.

Examination of the remote VFO switch showed an unused bank of contacts, so one of these was used to switch the 1000 Mfd. capacitor in and out of circuit. This switch is rendered inoperative by the blank accessory plug at the rear of the chassis when the remote VFO is not being used. Now I operate with the 1000 Mfd. normally out of circuit and switch it in when I need to give signal reports."

### CLARIFIER ACTION ON THE FT200

Another one from K. Moore VK4IJ. This time he suggests that the clarifier covers too wide a frequency range and that the tuning can be made less critical with a few simple modifications.

"The clarifier on my FT200 was as critical to set as the main tuning and covered an unnecessarily wide range for my purpose. The following modification was carried out.



This leaves the total resistance of the network unchanged and gives a much smoother action to the control. It now covers about 1/5th of its previous range.

## Try This

with Ron Cook VK3AFW  
and Bill Rice VK3ABP

### SUBSTITUTE ALIGNING TOOL

In an emergency the pointed clip from a ball-point pen can be used for turning slugs in Neosid formers. Being plastic they do not damage the slugs. If the lapping portion is trimmed off the clip will reach to the bottom of the Neosid former. (Only pens branded "Bic" appear to have this type of clip.—Ed.)

### BACKLIGHTING PRINTED CIRCUIT BOARD

An aid for checking the wiring of printed circuit boards from the component side is to use a back light from a 35 mm slide viewer. This is an even light and will shine through the p.c. board enabling component placement to be checked with the copper configuration.

### TOOTHPASTE TUBE KNOBS

The white caps from toothpaste tubes make an inexpensive source of control knobs particularly for miniature gear. The centres can be partially filled with Araldite so that when set, a flat is provided for a corresponding flat filed down on the spindle for a push on fit. Alternatively the caps can be tapped for a grub screw. (Or a metal tube insert may be cemented in.—Ed.)

Don Glider VK3AHG

## Newcomers Notebook

with Rodney Champness VK3UG

44 Richmond Rd., Boreham, Vic., 3155

It is nearly Christmas again, time to review activities for the year, and to plan for the forthcoming year 1975. This may well be the year that Novice Amateur Radio Operators start to make their appearance on the bands.

Whether you be an associate of the WIA, or a full member, the advent of Novice licensing will affect you in some way or another. As an associate who perhaps feels that he or she isn't up to the standard of the full licence the Novice licence may be just what you have been waiting for. There will no doubt be problems that will need to be ironed out as the Novice licence is introduced. Regrettably, there will be some full call amateurs who will resent the new Novice and will make life hard for the Novice by deliberately interfering with his QSOs and/or refuse to operate with him. Fortunately there will be others ready and willing to assist the Novice operator. I would like to point out that the licence as it has been proposed is for two year tenure only, so you will need to up-grade to the full or limited ticket within two years. I would suggest that any

Novice should concentrate the majority of his operating on CW to get his Morse speed up for the 10 wpm exam. CW is an excellent DX mode of operation; ideal considering the power proposed for Novice use.

I am hoping this coming year that I will have sufficient time to build a Novice style 80 metre transceiver suitable for CW or AM-CW use. I anticipate describing as completely as possible how each section works and presenting it as a workable project.

An additional club in Melbourne has started tutorial classes for aspiring amateur radio operators. This is the Eastern and Mountains District Radio Club, P.O. Box 87, Mitcham, 3132. Have other States got clubs who are running tutorial classes for aspiring amateurs? If so why not let me know so that it can be published.

Thought for the New Year — support the WIA, help it to improve amateur radio. If you think that the WIA is not doing things the way it should, don't just criticise, get into it and try to improve things — there are too few who help. Merry Christmas and a Happy New Year.

## Magazine Index

With Syd Clark, VK3ASC

### SHORT-WAVE MAGAZINE July 1974

Rejuvenating the AR88 Receiver; Cubical Quad for Two Metres, Low Voltage PSU.

### QST August 1974

An Active Mixer-Converter for 1236 MHz; Remote Control for the Morse Code Time Identifier; New Symbolism for Digita-Logic Diagrams; A Quasi-Logarithmic Analog Amplifier Limiter with Frequency-Domain Processing; Learning to Work with Semiconductors; The Helixwave Wander; Making Two-Sided Circuit Boards by the Photo-etching Process; Independent 8-Channel Frequency Selection with only Three Wires; A Remote Antenna Switch Amateur Radio SELF Monitoring.

### September 1974

A Simple 148 MHz Antenna for Oscar Ground Stations; An Experimental Frequency Underlaying ICs; Additional Frequency Ranges for the Coltrini 755-3; Phase-Locked Tuning in a Two-Metre Receiver; Off-Centre-Loaded Dipole Antennas, Learning to Work with Semiconductors, Part VI

### 73 MAGAZINE August 1973

Directional Wattmeters and Novel SWR Meter; FETs at 40 MHz; QSP to the 10m Band; R390A Modifications for Improved Performance; R-392 on the Air; Super Selective CW Tracking Filter; An Audible Voltmeter, Midland 2M Base or Portable, Cheap and Easy 230 V AC Power Supply; Universal Power Supply Review of Grounded Cathode Linear, Slide Rule Rules, SSTV Scan Converter, House Cleaning the Logical Way, ID Timer Fail Safe Switching Improved.

### HAM RADIO July 1974

Narrow-band Solid State 2004 MHz Pre-amplifiers; Product Detector, Miniature 7 MHz Transceiver, Camera Converter; Autopatch Design; 96 Wavelength Antennas for Two Metres; VHF Radio Observatory; Customs Enclosures, Solar Power Supplies.

### CQ July 1974

An Accurate Solid State Component Curve Tracer, QRP Commercial Gear Parts Sources, Antennas for Problem Areas, 1973 World Wide DX Contest, Phone Results.

### August 1974

The Transistor in 1926?; CQ Reviews the Robot Research SSTV Line; Indoor Antennas, 1973 CQ World Wide DX Contest; CW Results.

**VK5VHF**  
**World**  
 with Eric Jamieson VK5LP  
 Farnham SA 5233  
 Times GMT

**DECEMBER 1974**

**AMATEUR BAND BEACONS**

VK0	VK0R5A	Macquarie Island	52 180
	VK0MA	Mawson	83 100
	VK0GR	Casey	53 200
VK1	VK1RTA	Ganberra	144 475
	VK2W1	Sydney	52 450
	VK3RT	Sydney	144 010
VK3	VK3RTO	Vermont	144 010
VK4	VK4RT	Townsville	52 800
	VK4W1/1	ML Mowbullen	144 400
VK5	VK5V1	ML Lofy	53 000
	VK5V1	ML Lofy	144 800
	VK5RT	Perth	52 300
	VK5RTU	La poorte	52 350
	VK5RTT	Caranorra	52 800
	VK5RTV	Albany	144 500
	VK5V1	Perth	145 000
VK7	VK7RTX	Devonport	52 200
	VK7V1	Carvin	52 200
P28	P28GA	La Nugini	52 150
30	30DAA	Suva, Fiji	52 500
ZL1	ZL1VHF	Auckland	145 100
	ZL1VHF	Waikato	145 150
ZL3	ZL3VHF	Wellington	145 200
	ZL3VHF	Palmerston North	145 250
ZL5	ZL5VHF	Christchurch	145 300
ZL4	ZL4VHF	Dunedin	145 400

x denotes a change from last month

Some changes have been listing this month. Firstly, we have had a communication at long last from Sydney, through Roger VK2ZRN of the Roger's frequency. The VK2W1 2 metre beacon is correct. s/a also advises switching from the PMG Dept. regarding 432 and 1296 MHz beacons.

The Perth beacons will be using their new call sign VK6RTV and comprehensive testing carried out on them shows the 5 metre beacon to run at about 17 watts with low pass filter in place, and the 2 metre beacon 9 watts out. These beacons are listed as (i) seems likely they will be operating in time for the end of the year DX. Thanks to the VK6 VHF Group News Bulletin for the above info.

The first change concerns JA1JY in Tokyo. It appears there is just not enough operating room in the six metre band in Japan to be able to accommodate a beacon, not even 3 kHz! So JA1JY is off the air until further notice. I suppose one could say that that type of band occupancy there may be little need for a beacon. Perhaps VK6 could take one of the leaves out of the JA book and use it to fill up some of the spectrum space which amateurs with suitable equipment do have, but who come on the air only for about one month a year.

**AMATEUR TV**  
 A letter arrived from Noel, VK5EL (ex-VK5AGF) who works and lives at Ceduna, on the far west coast of S.A. (the same area as Kerry VK5BU), which was too late for inclusion in last month's notes. Noel is very interested in running skeds, over a long period, with a view to increasing the present ATV record. He proposes that as Adelaide, Melbourne, and northern Tasmania are in a direct line from Ceduna, that interested stations in these areas could come on together. He is also interested in skeds to VK6, 40 and 20 metre skeds would be maintained at the same time where practicable.

Present ATV tests are being carried out on 433.3 MHz, but this will be varied according to what other stations are using. Gear consists of modified Pye Industrial CCU and camera. Home base transmitter, wired for ATV, FM, and CW at 20 watts. Gaesling AT-100 converter, 18 cm wave collinear antenna is intended to run 432 kHz carrier, with CW or FM identification as time permits, other than sked times.

Noel asks if interested stations could contact him by letter (Noel Ferguson, 4 George St. Ceduna 5200) or on HF (7130 kHz 2500Z. Sundays). Channel 40 FM will also be monitored, beaming east, and

for local contacts. Also available this year will be 6 metres SSB using an FTV550, FTD550 and a 4 element yagi. Good luck Noel with your ambitious projects.

While still in the Ceduna area, a letter from Kerry, VK5SU, contains some news for the coming DX season. He advises that antennas are up, and have withstood various gales so far. He worked VK3ACM on 5 metres. During skeds on 80 and 40 with VK5PB and VK5MT he has heard their signals from Adelaide on 2 metres every time they have tried, sometimes just in and out of the noise, but the path is still in.

Kerry also advises that VK5BE advises 'The Albany beacon was put back into service a month ago. There is a move to have the beacon (VK5RTV) located on top of Mt. Adelaide, one of the hills in Albany which also accommodates the 135 MHz tropospheric beacon. The six metre beacon has been built and should be on the air shortly all solid state one watt output. The Channel 2 repeater has been operating for some months now. It is located on Mt. Barker at the old beacon site. It is a fairly late model Pye base with solid state receiver... there is an improved version on the way and should be up before Christmas... they hope to extend the present 60 mile radius considerably... The W.A. Group are putting a Channel 4 repeater on a hill about midway between Perth and Mt. Barker.'

**SIX METRES**

With the DX just around the corner at the time of writing, there are bound to be a few openings to other areas. HLWV was the subject of quite a few contacts around Australia when he broke through the barrier around 0300Z on 18/07/74 on 52.015. He was to be on again on Sunday 20/10 but no reports of any working. VK3's also through to VK5AGF on 29/10/74.

**PORTABLE OPERATIONS**

With the DX coming, and well here by the time you read this, it now seems the right time to pass on news of various DX-peditions taking place during December and January. Some people have written, others have called, and some on-line info, and the remainder the grapevine.

Steve, VK3ZAZ, is still hoping to follow through with his planned DX-pedition to Norfolk Island, planning to be away for 5 weeks, but due to accommodation problems, now only three weeks from 2/12/74. He will use the call sign VK3ZAZ, but has some optional on 5 metres, listening mainly 52.0 to 52.1, using 52.06 calling freq. (52.1 for benefit of G2), or if the lower portion of the band gets crowded will operate from crystal position 52.325 MHz. On 2 metres he will call and listen on 144.100. Both bands will be SSB at 400 watts. 432 MHz equipment will also be going along but contacts attempted by appointment only. Site will be on the northern end of island, about 1,000 feet a.s.l. There will be an official QSL card. VK3TV the official QSL manager. Box 66, P.O. Avoca, Vic.

Steve has a considerable compliance with arrangements, due to remoteness, insufficient accommodation available for that time of the year, uncertainty of arrival date of equipment, escalating costs of air and sea fares which all adds up to say the above information sets out what is possible. In confirmation of what the above expedition has taken place will be confirmed through the WIA Official broadcasts, there is no other way under the circumstances. Anyway, good luck Steve and let, we hope your trip eventuates and proves successful.

**NEW ZEALAND**

Don ZL3RW sends a brief note advising that a group of Christchurch VHF enthusiasts intend to "ASSAULT VK" on the New Year weekend, intending to go to a location at Denniston near Westport (2000 ft. a.s.l.) on the South Island of New Zealand, operating 2nd to 4th January inclusive. (Pity. The weekend before would probably suit VK better... SLP).

Equipment will be SSB, 52.0 and 144.2 MHz, the usual channels for working VK/ZL. Other working bands to be used will be 80, 40, and 20 metres for local and VK contacts.

**BOUT GAMBIA**

Colin VK5OK advises there will be VK3ZAZ DX from the Mt. Gambier area again this year, on 28th and 29th December, and could be 30th December if that day is a public holiday. Operating from Mt. William using 6 metres AM and FM, 2 metres

SSB and FM, will be Peter VK5ZCW, Robin VK5ZAT, Dale VK5DA and Tony VK5ZCN. Probable call-sign, VK5DA/P.

Another party with Colin VK5DK, Trevor VK5TH Bob VK5ZNR propose operating from The Bluff using VK5ON/P, and operating 6 metres SSB, 2 metres SSB, and possibly 432 kHz SSB. Operating dates similar to the other party.

**VICTORIA**

It appears Dany' VK3AQR is arranging for one group to go out portable, no other details available. Mike VK3ASQ proposes to again be on Mt. Cowley for the fourth time, and other details are being heard from VK2 or VK7. What someone will be going out from VK1, who knows? I don't in VK8, the Albany area will be the one to watch where there should be 6 and 2 metre activity and possibly some 432 Bear in mind also Kerry VK5SU at Ceduna, who is likely to be available much of the interesting operating times for DX.

**SOUTH AUSTRALIA**

No advice of any other operations than that of my own expedition, starting on 26th December and concluding on 1st January inclusive. Full details of operating equipment was listed in August AR. Some changes are necessary with the passage of time, and the amended information as of this date is as follows: 6 metres SSB CW and FM, 2 Metres the same 432 MHz SSB and CW Calling and listening frequencies 52.050 SSB, 52.325 FM 144.100 SSB, Channel 40 FM (144.000) or other FM channels. A two red 432 110 SSB. General practice will be to use the call frequencies when the band is quiet but at other times 52.110 144.110, and 432.110 will be used, with the idea of getting off the calling frequencies to leave them free for other distant places to use and get in on the call. The site for the expedition is Myponga Hill, 10 km from the 1922 site of Myponga, approximately 54 km SSW of Adelaide and 478 metres high. It has a good take off in all directions. All Dazs know where to point their beams on Adelaide, so aim a few degrees to the south of that and you will be on Myponga Hill. At this time of writing, the weather is not ideal, but unlikely to make it with 576 MHz this time, will too much shock-work for enough time to finish the construction work.

**THE UK IS COMING**

It is for sure. A few helpful hints for those perhaps new to the game, and maybe some others could use. Firstly, the UK is a very busy country, but by merit, for both receiving and transmitting especially the latter, I repeat, good STABLE equipment. There are so many narrow bandwidth transceivers around today that they just cannot handle satisfactorily a drifting signal, let alone one with FM on it as well, if you are in doubt about your home built VFO, then arrange for your equipment to accept a crystal oscillator, and switch over to this for the important occasions. A crystal will be OK if you keep out of the bottom 300 kHz when the band is wide open, you would be unlikely to interfere someone else crystal locked on your frequency. If you are listening, you may use a narrow bandpass modulated, very well modulated in fact. If you want to be resolved successfully by those transceivers. Plenty of audio will ensure you are received in the excited carrier position and received elsewhere in the same manner as a sideband signal, and one drawback only — that's why you need modulation 50 watts of RF carrier a.s. AM with 25 watts of modulation may be OK as far as the test books are concerned, but you will need more than this to be a success with modern SSB receivers. Reduce your carrier signal to about 10 watts, and use 25 watts of modulation, and 50 watts of audio on it — you will be surprised how much louder it sounds. Watch out for splatter however. For correct results, you should use a high pass filter under these conditions and properly adjusted you can run the same amount of audio as RF power in watts and still provide a clear, narrow signal.

And haven't some of you boys ever thought about looking on your own transmitter frequency after calling CQ? Nothing is more frustrating to zero in on someone calling CQ and have him conclude by the way, "that was me" and then leave the set. Operators using transceivers will most probably be found on your calling frequency, unless they are lucky enough to have an additional VFO to give them split frequency tuning ability, but most prefer transceive these days. Therefore, you chase



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JANUARY - DECEMBER 1974

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## Trade Review

The G.T.C range of RF Power Transmitters is now available from Ampec Engineering Co.  
G.T.C. has one of the most extensive ranges of RF Power Transmitters in the Communications industry. This range of Transmitters includes —  
Land Mobile 12V — 50 to 950 MHz, some devices allowing 70 watts output.  
Hand Held 5V — 175 and 470 MHz.  
AM Transmitters 13V — 150 watts up to 120 watts peak.  
Military 28V — 50 MHz to 950 MHz devices available.  
Linear Frequency ranges include 2-30 MHz, up to 1000-2000 MHz.  
Microwave — up to 3000 MHz with 5 watts output.  
A new product listing is available. This listing shows all the devices currently available and standard packages.  
As well as this range of devices, several RF amplifier kits are available ready for assembly. These kits include the transistors, all components and printed circuit board. Circuit diagrams with design and assembly hints are also provided.

## Contests

with Jim Payne, VK3AZT  
Federal Contest Manager,  
Box 67, East Melbourne, Vic., 3002

### REMEMBERANCE DAY CONTEST

Forty-nine certificates have been awarded and these will be posted as soon as possible. About 70 entrants forwarded comments with their logs and many remarks were similar to those from Jim, VK2BDO, "It was an excellent contest operated in the best spirit, I remember in my contest." Only a few queried the scoring table, usually asking how certain scores were determined. Well the more one thinks about that scoring table the more one involved the problem becomes. Roy VK2TR says he's 2 with CW transceiver "is a dream to use". From the gyrations of my own 8 meter many other stations were killing waits to some order. So, on power alone the scoring chart has deficiencies. Eric VK3's inward QSL manager has commented "I think the event was better patronised than it seems the case. One growl. The use of BK without a grr doesn't help the CW SWL contestant — call signs should be sent at all times." That's a good point, particularly as CW contests could double.

Murray, VK4KX writes "Unfortunately once again 28 MHz is a bit slow almost nil." Quite a number of others commented on that situation. Another VK4 with a powerful neighbour suggests contestants should have to QSY after five consecutive DXR type contacts. John VK3ZT says 15 and 10 did not open as he QTH. Also a number of local stations using heavy commercial grade operating at times. Mobile 500, VK5OP writes "I was particularly pleasing to hear so many 2 call works on the 2m FM section of the bands. The contest procedure was very much superior to that heard on 2m bands where very often stations were failing to confirm and/or were 'revved'."

Nel, 5FI said "Nothing much heard on 15 and 10." And the RD the best AR award of the year. Leonard, VK5UG comments "At 73 still enjoy it, but — require two BYTs as log keeper and check sheet." Tom, VK2AT said he enjoyed it tremendously. As usual, a lot of the other comments from VK7 hint session unless repeaters can be used in the RD and Norman, VK9NR has made out a very good case. Yes Norman you have "bashed the wrong ear" but the right ear will hear about it. Bruce, VK3AZ for 21 MHz and 21 MHz was virtually non-existent and 7 MHz was not much better." Doug, VK8KK reported similar band conditions, also said "Spirit of contest was truly great, but even! Clansmen should be banned or the operators shown how to use them. The number of QRT frequency QRTs were staggering." Frank ZL4BE, Claude, ZL2KX and Eddy, ZL1ACL all commented about the enjoyment they gained from our contest.

In the August issue of "The Radio Bulletin" in the column headed Editor's Comments, the value of contests is questioned. An extract from the final paragraph reads "Is your goodwill increased by working a hundred stations for about thirty seconds each? If so now? Do you get fun from breaking into contacts already in progress and harassing other stations for numbers? If so why? Is your goodwill increased when you are driven off a frequency (particularly if it is a net) by stations calling "QO Contest" over the top of the station you are trying to work? Surely not! Perhaps the value of contests has been exaggerated. What do you think?"

Well Glenn VK6KY covered that question in the letter which accompanied his RD log. "It was good to find so many stations who were willing to take the time to give their 'handies' this year. Everyone worked was, at least, very friendly. Given more time to chat, rather than rushing to get numbers across, one could make a lot of new friends. It's a pity that the majority of amateurs don't have the time other than during the RD, to spend populating our bands. Still, at least, we do have the RD and it gives those of us that have time of other important things to do as well, an excuse to "forsake all others" and devote our attentions to getting on the air and renewing old friendships and meeting new amateurs. In general, thanks

## John Moyle Memorial National Field Day Contest Rules - 1975

Amateur operators and Short Wave Listeners are invited to make this contest, held in memory of the late John Moyle, a huge success.

Contestants may participate either as individuals or as part of a group. There are two Divisions in this contest. The first one is for 24 hours continuous operation and the second for any continuous period of six hours. Either period must be within the 26 hours available.

### CONTEST PERIOD

From 0600 GMT, Feb. 8th, 1975 to 0800 GMT, Feb. 9th, 1975.

### OBJECTS

The operators of portable field stations or mobile stations within the VK call areas will endeavour to contact other portable, mobile or fixed stations in VK, ZL and foreign call areas on all bands.

### RULES

- In each Division there are 8 sections.
  - (a) Portable field station, transmitting phone
  - (b) Portable field station, transmitting CW
  - (c) Portable field station, transmitting open
  - (d) Portable field station, transmitting, phone, multiple operation
  - (e) Portable field station, transmitting, open, multiple operation
  - (f) VHF portable field station or mobile station, transmitting
  - (g) "Home" transmitting stations.
  - (h) Receiving portable and mobile stations.
- In each Division, 24 or 6 hour, the operating period must be continuous.
- Contestants must operate within the terms of their licence.
- A portable field station must operate from a power supply which is independent of a vehicle or permanent installation.
- No apparatus may be set up on site more than 24 hours before the contest.
- All amateur bands may be used but cross band operation is not permitted.
- Cross mode is permitted but note rule 21.
- All operators of a multi-operator station must be located within approximately an 800 metre diameter circle.
- Each multi op transmitter should maintain a separate log.
- All multi op logs should be submitted under one call sign.
- Only one multi op transmitter may operate on a band at a time.
- RS or RST reports should be followed by serial numbers beginning at 001 etc.

### SCORING FOR PORTABLE FIELD STATIONS AND MOBILES

Portable field stations and mobiles, outside entrants call area—15 points.

Portable field stations and mobiles within entrants call area—10 points.

Home stations outside entrants call area—5 points.

Home stations with the entrants call area 2 points.

### 14. SCORING FOR "HOME" STATIONS

Portable field stations outside entrants call area—15 points.

Portable field stations within entrants call area—10 points

15. Portable field stations may contact any other portable field station twice on each band (10-100) during the period of the contest provided that four hours a week after the previous contact with that station on that band.

16. VHF portable-mobile field stations may contact any other VHF portable-mobile field station repeatedly provided that two hours elapse after the previous contact on that band.

17. Operation via active repeaters or transmitters is not acceptable for scoring.

18. All logs shall be set out under headings of Date-time in GMT, Band, Emission, Callign, RST sent, RST received and Points claimed. List contacts in correct sequence. There must be a front sheet to show Name, address, division, Section, call sign, call signs of other operators, location, points claimed, equipment used and power supply. You must also certify that you have operated in accordance with the rules and spirit of the contest.

19. Certificates will be awarded to the highest scorer of each section of the 6 hour and 24 hour divisions. The 6 hour certificate cannot be won by the 24 hour entrants. Additional certificates will be awarded for excellent performance.

20. Entrants in sections a, b, c, d, e and f must state how power for transmitting a derived.

21. All CW-CW contacts count double. Cross band contacts do not count double.

22. Entries must be forwarded in time to reach the Contest Manager by 21st March 1975. The address is Federal Contest Manager, Box 67, East Melbourne, 3002.

### RECEIVING SECTION

This section is open to all short wave listeners in VK call areas. Rules are as for transmitting stations but logs do not have to show report and serial number of the second station or station called. Logs must show the call sign of the portable or mobile station heard, the report and serial number sent by that station, and the call sign of the station called. Scoring is as shown in Rule 14 for home stations. A station calling CQ does not count. Portable-Mobile stations, which must be listed in the left hand call sign column of your log, alone count for scoring. Stations in the right hand column may be any station contacted. A certificate will be awarded to the highest scorer of each of the 6 hour and 24 hour divisions. Individual or multi operator entries. Certificates will be issued for excellent performance.

for the RD Contest and may it stay one of the best parts of amateur radio in Australia!"

### RD CONTEST RESULTS

STOP PRESS—Due to mishandling at a post office the following logs which were posted about 16th/18th Sept were delivered to FCM today 22nd Oct 1974. Subject to confirmation of scores claimed there are new section winners listed here. The first figure are points scored and the second contacts made—

RECEIVING: M. Wójtyński (VK3Z)	142	81
Phone VK3Z	81	21
WT	74	20
GI	69	22
Phone VK3AUG	313	120
ZML	219	129
FW	154	49
ARS	137	17
SK	33	23
VK5ZFJ	101	101
ZAP	66	58

VK6QG	368	177
JI	360	250
AS	218	84
ZDA	200	202
WA	114	80
VK7LP	1096	510
VK3AS	528	119
VK7CIC	990	11

### OPEN. VICTOR HULL MEMORIAL VHF-UHF

December 8 — Starts Rules in Oct AR

December 7 — TOPS CW

December 8-8 — ARRL 190 CW

December 14-15—ARRL 10 metre

December 14-15—Spanish CW

December 22 — Hungarian.

### TOPS CW CONTEST

1900 GMT Dec. 7 to 1900 Dec. 8.

CW activity between 3.5-5.5 MHz with DX on the low end. RST report only. For details send SASE to FCM.

## Awards Column

with address, phone, and  
P.O. Box 7A, Olathe, KS 66061

### ADDITION TO ARRL COUNTRIES LIST OF KINGMAN REEF, KP8

Geographically Kingman Reef is located at the northernmost tip of the Line Islands in the Pacific Ocean. It is owned by the United States. Submissions of Kingman Reef confirmations for DXCC credit may be made starting October 1st, 1974 (Sept QST).

#### DMP AWARD

1. The award is available to licensed amateurs and shortwave listeners (on a "best of" basis).
2. Contacts on and after 20th July 1947 are valid.
3. Do not send QSL cards. A list showing full details of the contacts should be certified by the Awards Manager of a National Society.
4. The fee for the award is 10 IRCs.
5. The address for applications is:

REF

Av. Margne, #1-11 DE  
Dafundo-Libon 3,  
Portugal.

#### Requirements.

One confirmed contact is required with each of the following areas:

1. CT1 Portugal
2. CT2 Azores
3. CT3 Madeira
4. CR3 Port Guinea
5. CR4 Cape Verde
6. CR5 St. Tome and Principe
7. CR6 Angola
8. CR7 Mozambique
9. CR8 Port Timor
10. CR9 Macao

#### AAA AWARD

1. The award is available to licensed amateurs.
2. Contacts are valid from November 1948.
3. Do not send QSL cards. A list, showing full details of the contacts and the country should be certified by the Awards Manager of a National Society.
4. The fee for the award is 10 IRCs or 60 cents.

(South African currency). It is, however, issued free of charge to members of SARRL.

#### 5. The address for applications is:

Awards Manager

South African Radio League

Post Box 3911

Capetown

Rep. of South Africa

Rules: Only mainland stations count islands round the coast of Africa are not valid.

Where countries have changed prefix or name, like Z8R to A2 then either prefix is valid.

Where countries have been subdivided like French West Africa (FF) — then either the old prefix (FF) is valid or one only of the subdivisions—FF or one (only) of TU, TY, XT, STS, 8W8, 507, 3K

Requirements:

Confirmed contacts are required with

- |     |             |
|-----|-------------|
| Z81 | Z8R         |
| Z82 | Z87/Z05/306 |
| Z83 | Z84/7P8     |
| Z84 | Z8R/A2      |
| Z85 |             |

plus 25 call areas from the list of call areas

## Y.R.C.S.

with Bob Guthberlet

3 Bandon Tce., Marino, S.A.

Two excellent publications have been sent for my perusal . . . "Lat's Talk Translators" and "Space Science Involvement". The first deals with the structure of Matter and its applications to transistors, transistor circuits, transistor circuit operation, etc. This is a very useful booklet, published by ARRL. The second also published by ARRL is a curriculum supplement for classroom use and outlines Space Science, Physics, Mathematics, Astronomy and Communication Questions and answers are given at the conclusion of chapters. For the instructor and student I can recommend both. Copies have been sent to the YRCS Federal Education Officer, Allan Dunn, 18 McKinley Ave. Elizabeth Downs, SA 5173, who can supply further information on cost (one free and one modest in price) and how to obtain them.

The year 1974 is rapidly drawing to a close and supervisors will be seeking statistical information from club leaders. I hope we shall be able to report increased interest and membership. During the YRCS Federal Conference 2 emphasis was made to publicise the Scheme, as without such we cannot hope to achieve support from the great number of youth, who with greater leisure time than ever before, surely need what we can offer.

This has not been an easy year for YRCS, as the revision of our education programme has been difficult, mainly due to the uncertain state of the commencement of Navis increasing under the guidance of Allen Dunn we anticipate an improved uniform syllabus for club instructors.

I shall be leaving Kadina on December 31, 1974, and my new address as from early January 1975 will be 3 Bandon Tce., Marino S.A. Phone 259 8472. As this will be my last printed communication for this year, may I wish for all interested in and working for YRCS, a happy Christmas and a New Year of successful operation in Clubland.

## PROJECT AUSTRALIS

with David Hul VK3DZH

The following are the "on" orbit equator crossings for Oscar 6 for December Times are GMT. Days are local.

Orbit	Time	Equator	Orbit	Time	Equator
Dec.	(Z)	(°W)	Dec.	(Z)	(°W)
<b>Mon. 1 Dec.</b>			<b>Mon. 16 Dec.</b>		
0720	2137	12	0914	0828	189
0721	2332	41	0915	1121	218
0722	127	70	0916	1318	247
<b>Mon. 2 Dec.</b>			<b>Thurs. 19 Dec.</b>		
0739	1002	128	0955	430	173
0740	1157	227	0952	1013	202
0741	1352	256	0953	1210	233
<b>Thurs. 5 Dec.</b>			<b>Sat. 21 Dec.</b>		
0777	1051	211	0976	815	172
0778	1546	256	0977	1010	200
0779	1641	268	0978	1205	228
<b>Sat. 7 Dec.</b>			<b>Sun. 22 Dec.</b>		
0802	1046	309	0982	1943	344
0803	1241	338	0983	2140	373
0804	1436	287	0984	2335	402
<b>Sun. 8 Dec.</b>			<b>Mon. 23 Dec.</b>		
0807	2021	353	10001	810	170
0808	2218	32	10002	1040	198
0809	0011	51	10003	1200	228
<b>Mon. 9 Dec.</b>			<b>Thurs. 26 Dec.</b>		
0827	1041	308	10028	850	183
0828	1236	237	10040	1055	211
0829	1431	295	10041	1250	240
<b>Thurs. 12 Dec.</b>			<b>Sat. 28 Dec.</b>		
0854	838	192	10064	855	182
0855	1131	221	10065	1050	211
0856	1325	249	10066	1245	239
<b>Sat. 14 Dec.</b>			<b>Sun. 29 Dec.</b>		
0880	951	190	10089	1830	325
0881	1128	191	10090	2023	354
0881	1321	248	10071	2220	383
<b>Sun. 15 Dec.</b>			<b>Mon. 30 Dec.</b>		
0886	2101	3	10069	850	180
0886	2256	32	10090	1045	209
0887	0051	60	10091	1240	238

#### OSCAR 7

By the time this AR is circulated Oscar 7 (H successfully launched on Oct 29) should have settled into a normal routine as follows—

Sundays GMT—Mode A 2m to 10m Repeater on 435 beacon operable

Mondays GMT—Mode B 70cm to 2m repeater on 145.95 MHz beacon on

Tuesdays GMT—Mode A

Wednesdays GMT—Mode D Recharge mode 435 beacon operable by command

Thursdays GMT—Mode A

Fridays GMT—Mode A

Saturdays GMT—Mode B

It is hoped to include orbit details in future ARs once orbit parameters are known. Latest information may be obtained from your local state co-ordinator and/or WIA broadcast.

## CRYSTAL FILTERS - FILTER CRYSTALS - OSCILLATOR CRYSTALS

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XF903 8FO 8999.0 kHz  
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Filter Type	XF-90A	XF-90B	XF-90C	XF-90D	XF-90E	XF-90F
Application	SSB Transmitter	SSB Tx/Rx	AM	AM	FM	CW
Number of Filter Crystals	8	8	8	8	8	4
Bandwidth (dB down)	2.5 kHz	2.4 kHz	3.75 kHz	5.0 kHz	12.0 kHz	8.5 kHz
Passband Ripple	<1 dB	<2 dB	<2 dB	<2 dB	<2 dB	<1 dB
Insertion Loss	<3 dB	<3.5 dB	<3.5 dB	<3.5 dB	<3.5 dB	<5 dB
Input/Output	2, 500 Ω	500 Ω	500 Ω	500 Ω	1200 Ω	500 Ω
Termination	C, 30 pF	30 pF	30 pF	30 pF	30 pF	30 pF
Shape Factor	(6:50 dB) 1.7	(6:50 dB) 1.8	(6:50 dB) 1.8	(6:50 dB) 1.8	(6:50 dB) 1.8	(6:40 dB) 2.5
Ultimate Attenuation	>45 dB	>100 dB	>100 dB	>100 dB	>80 dB	>90 dB
Price	\$37.06	\$45.45	\$48.95	\$48.95	\$48.95	\$34.25

In order to simplify matching, the input and output of the filters comprise tuned differential transformers with the "common" connections internally connected to the metal case.

Registration Fee: \$1.00; Air Mail: 26¢ per 1/2 oz.  
Shipping weights: Filters 2 oz. ea., Crystals 1/2 oz. ea.  
All Prices in U.S. Dollars.

# Hamads

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- \* \$5 per 3 cms. for other amateurs and S.W.I.'s.
- \* Copy should be in block letters or typewritten, signed and forwarded to The Editor, P.O. Box 150, Toorak, Vic. 3142.
- \* Excludes commercial advertising.
- \* Closing date for Hamads is the 3rd day of the month preceding publication.
- \* QTHR means the advertiser's name and address are correct in the current Australian Callbook.

## FOR SALE

**Beckmann DVM Model 4011 RVP** with handbook, **\$20 Gelose TR222 AM Transmitter**, **\$20; AWA M20 2m FM with Ch A, C and T, \$40 VK3TX, QTHR.**

**FTDX 400** in good cond, open to any reasonable offer. Apply to **Charles Lloyd VK4CZ**, 68 Callison Way, Koonoos 6064, W.A.

**Bendix Freidmover** MC 221-c, CW 2-1 MHz crystals, 2 boards, 2 spare valves & AC-PS, **\$20; HX Tape recorder** with 12 - 7" reels of misc. tape, **\$10; A Bulk eraser**, **\$15; AM/CW/SSB Transmitter**, 3 band, 2-507, 80 watt Mod Sp-amp, and AC-PS (Want the bench space), **\$20 VK3EM, QTHR. Ph. (03) 58 7748.**

**ART** with all coil boxes power supply with 2 metre converter. Good order **\$50 WIA NSW Divn. Blue Mts. Branch, c/- VK2BHS, QTHR.**

While they last - **AWA Car Phones FM, Tx and Rx, 70-85 MHz** with power supplies, some cables and hand sets. Best offer. See **L. D. Sykes, 8 Somers Parade, Edinville, 3198. Disabled Radio Amateur Club VK3ZT.**

**160W CW/AM Station.** Table top Tx, Gelose with pair of 6146 in final, 80-10m Rx, Lafayette HE30 ant. SW with 12 with RF meter, switch operation, **\$125, VK2KD QTHR. Ph. (02) 853 1246.**

**TCA 1877 hybrid mobile** TRx 3/20 final, MPF121 front and end, C40 (B) xtals. **\$60 ONO; TR 9800DS Rx** plus spkr, phones, AR mode, xtal calibrator, **\$118 ONO; TCA 1874 remote control base**, 6/40 final, plus manual, coils, 55 mV, rotatable mast and 2 x 6 ft. E antenna. Best offer. All must go - heading for Q-land in March. Mike VK1ZMV, 18 De Chair St., Deskin 2600. Ph. (082) 81 1312.

**WWV Receiver**, Beckman 906, crystal locked 2.5, 5, 10, 15, 20, 28 MHz, as new, **\$75; Collins 2300 MHz parametric amp.** with control and power unit, spare klystron, **\$235. VK1VP, QTHR. Ph. (062) 84 8888.**

**Rx - newbore**, 18 tube double contr., xtal locked, handsets only, 30-10 metres, BFO, noise limiter, inbuilt 240 V PSU, Kokusai mech. filter, **\$135. B. Hannan, WIA-L3168, 17 Hercules Ave., Emerald, 3782. Ph. (09) 68 4571.**

**Yaseu DFD 401 Transceiver**, **\$375. Prop. Pitch Motor AC operated**, Selsyn indicator units fittings, and loops for solder ribbon quad (see QST Dec 1987), **\$60. Call or write to Mike VK2KZ, Unit 572 Borden-Brae 50 Pennant Hills Rd., Normanhurst, 2075.**

**FT-2 Auto.** All 8 channels fitted with crystals. Deviation up-minus 7.5 kHz. No spurious outputs on any frequency. Aerials available, 1/4, 1/2 and 1/2 wavelengths mobile plus coaxial dipole for fixed use. Two manuals, JA and English, in original carton, **\$375. Ivor Morgan VK3DH. Ph. (03) 82 3026.**

**Back issues of AR 1949** to date inclusive, good condition. Packed and freight paid, **\$25. Yaeis, PO Box 1088, Orange 2800.**

**Precision regulated PS**, rated at 1.5 amp at 13.5 V, 2 x 2 x QCEQ/45A, 2 x QCEQ/20A, 2 x 6146A, all as new, never used, what offers? Will accept form of forego for antenna rotator VK4ZFM (ex VK2ZKA). Ph. (072) 40 3210. Write: 11 St. Patrick's Ave., Kurnaby, Gld. 4110.

**Antennas**, Gem fibreglass quad, Mosley trap vertical 40-10-15 metres, Heathkit Marauder transmitter, **\$58, AM, PSK, 160 watts PEP, Heathkit CM 12 CTR 40V 1000V condenser bridge**, all with manuals, **\$600/250 mA power supply, 30-100 new valves, 4 x 250 etc., boxes of resistors, capacitors, transformers etc.** all new, many other goodies, **\$400 takes the lot. J. Parsons, 18 Aramac St., Koppers, 2202.**

**HiMicrotrans Comm. Receiver**, the famous SX-122A; matching speaker; 100 kHz Plug-in Cryst. Vibrator, Selectivity System. As new, with many refinements. Reasonable offers considered. Dr. (Engineer) J. C. Pittas, 14 Monrovia Court, Sandy Bay, Tas. 7005.

## WANTED

**CTR 18 Grammed** Karphone Circuit/Manual wanted for Serial No. B1587 AM 12 V 75 watt, VK3ZLA, 5 The Close, Frankston, Vic. 3199. Ph. (03) 63 0311, AM 783 7717

**Amateur band or general coverage receiver.** Write details and price: R. N. Jacob, 429 Kothoff St., Levinston NSW, 2641

**BC348** 4 Section tuning gang or incomplete or not working chassis for redevelopment. Command Rx, 7-9 MC wide spaced tuning gang or similar chassis as above. I. D. Stockton VK2AAJ, QTHR. Ph. (02) 48 4721.

**R589, R589, SP400 JX, R382, R381.** Cond. secondary importance. Spares or incomplete units, technical handbooks. Also US Armed Forces technical manuals, army uniforms, American, even airforce uniforms or pieces, and military badges, etc. **PRCBA, 10A, 5A, 28, 77 E. Also SSX receiver** adaptor Dusty Leopold, L5134, PO Box 63, Warraloo, NSW.

**175 kHz Tapped** Dec. Coll. Cheap VLF Rx 10 kHz-500 kHz ADF RAB RBA RBL DZ RE etc. Jiffy Silvester, SWL, 30409, 9 Goodwood Drive, Springvale, Vic. 3171. Ph. AM (03) 548 3940.

**Compatible wanted** by ZL3AX on Dexionist VK from March 1975. Replies to 20 Thompson Rd., Napier, New Zealand.

**ART Coil Boxes** in good order, full set or single, condition and price to VK2PT, QTHR.

**Valves** - Types M54, 27, D2, UX250 and X851 for use in restoring a rather elderly wireless. Peter, VK2ZFX, QTHR. Ph. (058) 81 1253

**Exchange 800watts 720W Mhz 11 VHF Rx 18-165 MHz** in very good condition, with workshop manual, for any HF pair or will sell. Particularly want biner with PSU suitable for following a KW2000A SBL Senior, VK2ZBA, "Birkenau", Bundarra Road, Armidale, 2350. Ph. (067) 75 1154.

**Details of small 888/CW 20 and 40m "back-pack" rig** under 5 lb. weight including batteries of a kind available anywhere. Please contact Sam Kaufman, VK2SK, QTHR

## 20 Years Ago

with Doug Frazer VK2CMA

Technical articles were the main stay of the December 1964 issue of 'Amateur Radio'.

First was 'An Electronic Keyer' by E. A. Maratelli VK2AEZ. It was a simple device which compared with today's highly complex solid state keyers. VK2AEZ used only two tubes plus a small AC power supply.

Ladies Beware, or the tale of the perjured tax strainer, was reprinted from the R589 Bulletin. It told how the XT-1A tax strainer was converted into a microphone with the addition of a cheap crystal insert. During the 1960s the old ATS transmitter was a popular choice in many amateur shacks. Of course it was not ideal in many respects so modifications were many and varied. A. W. Winter VK3DR presented his version with an article entitled 'ATS Rebuilt and Modified'.

Tom Athey was still at it with his Complete Amateur series 'A System For Monitoring your Outfit' told how to construct a simple 'scope' and showed how to connect it to a transmitter to obtain the usual patterns. 'Stable VFO operation at 144 Mc.' Ouble a problem in those days. Dr. Robert Black VK2QZ overcame it by using the method of beating a 3MHz VFO against the sixth harmonic of a 7.5 MHz crystal and the tripling the resultant output to 144 MHz.

Reports for the month include the full results of the 1964 Remembrance Day Contest. Top scorers in each State were VK5MS, VK6TK, VK7LJ, VK3CO, VK4TH, and VK2AKV. This is also the order in which the states finished in contest.

The NSW South Western Zone Convention held at Tumut was described in great detail even to a full list of those attending.

# Silent Keys



Bob Wookey, VK3IC, passed away in Geelong, on Sunday 29th October. Bob was originally licensed in 1925 and would have been one of the longest standing members of the WIA. He was a foundation member of the Geelong Amateur Radio Club, and served the Committee in various capacities over the 28 years of the club's existence. Bob was active on the HF bands and was always a willing worker in club activities such as working bees, field days and in recent years, the Geelong Harvest.

Bob will be sadly missed, not only by his many friends in Geelong, but also by those who had made his acquaintance over the air. Our sincerest thoughts go to Bob's sister Edith brother George, and the remainder of Bob's family.

A'An Grady, VK3LV  
President, GARC

## FRANK COX VK3APO

Newcastle and Ham Radio are the poorer for the loss of Frank Cox VK3APO who passed away suddenly in early October aged 62.

Frank enlisted in Army Signals in 1929, was Commissioned in 1939, saw service in the Middle East and New Guinea, was awarded the OBE in 1958 and retired from the Army in 1962.

Since 1982 he has been active on the Air and in WIA as well as being deeply involved in Civic Affairs. He was a member of the Hunter District Water Board at the time of his death.

He leaves a wife Jean and a daughter. He was a good citizen.

VK2KB

## WANTED - PROP. PITCH MOTOR.

Replies to ZL3BI, 18 College Ave., Christchurch, New Zealand.

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A 40 meter SSB mobile transceiver 160 watts PEP  
12 volt DC. CW facility. Fully solid state. Retail \$269-00

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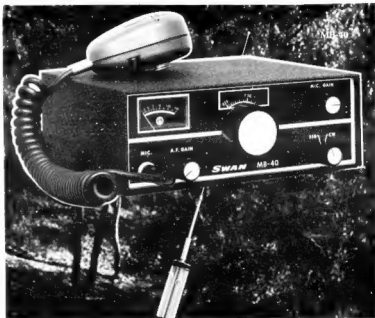
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Sydney: PARIS RADIO ELECTRONICS, 7a Burton Street, Darlinghurst, N.S.W.  
2010. Phone: 31-3273.  
Perth: W. J. MONCRIEFF PTY. LTD., 176 Wiltenton Street, East Perth.,  
6000. Phone: 25-5722, 25-5902.  
Brisbane: FRED HOE & SONS PTY. LTD., 246 Evans Road, Salisbury North,  
4107. Phone: 47-4311  
Adelaide: ROGERS ELECTRONICS, P.O. Box 3, Modbury North, S. A.  
5092. Phone: 64-3296.

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YC 355 D digital frequency counter still only \$250  
Spectronics DD-1 digital counter for 101 / 401 \$150  
FT DX 400 / 560 noise blankers \$20

## HY-GAIN ANTENNAS

14 AVQ 10-40 M vertical 19 feet tall no guys \$65  
18 AVT / WB 10-80 M vertical 23 feet tall no guys \$90  
TH3JR 10-15-20 M junior 3 el. Yagi \$135  
TH3MK3 10-15-20 M senior 3 el. Yagi soon \$180  
TH6DX 10-15-20 M senior 6 el. Yagi \$225  
204BA 20 M monoband 4 el. full size Yagi \$190  
DB 10-15 10-15 M 3 el. Yagi ideal for use over 204 BA \$110  
Hy-Quad 10 / 15 / 20 M full size Cubical Quad \$200  
Magnetic base mobile whip 108 MHz up with 18' RG-58U cable and coax plug \$18

## CDR ANTENNA ROTATORS

AR-20, smallest model only for 2m beams \$40  
AR-22R for stacked 2 & 6m or small HF beams \$50  
Ham II with re-designed control box, now with separate brake-control \$150  
All for 230 V AC with indicator-control units.

## BARLOW-WADLEY RECEIVERS

Model XCR-30 Mk II 500 kHz to 31 MHz continuous coverage, crystal controlled reception of AM / USB / LSB / CW \$250

## NOISE BRIDGES

Omega TE 01 up to 100MHz \$28

## 27 MHz NOVICE LICENSEE & CITIZEN-BAND EQUIPMENT

MIDLAND 5 W AM 23-channel transceivers complete with PTT mike all channel crystals 12 V DC op. \$95  
PONY 5 W CB-78 identical to Midland 5 W transceivers \$95; CB-74 5 W AM with 27,880 xtals, fishermen \$80  
SIDE BAND BRAND NC-310 one Watt hand-held transceivers \$50; SE-501 SSB / AM 15 W PEP SSB 23-channel transceivers, complete with PTT mike etc. 12 V DC \$190

## 144 MHz TWO METRE EQUIPMENT

KEN PRODUCTS KP-202 hand-held 2 W output transceivers, now with 4 Australian channels, 40 & 50 plus a choice of 2 repeaters 42 / 54, 44 / 56, 46 / 58, 48 / 60 \$150; KCP-2 battery charger and 10 NICAD batteries \$35  
Leather case for KP-202 \$5; Extra crystals for KP-202, two crystals per channel \$8

KLM ELECTRONICS solid state 12V DC 2 M. amplifier, 12 Watt output, automatic antenna change-over when driven, ideal for mobile use with the KEN KP-202 \$50

All prices quoted are net, cash with orders, sales tax included in all cases, subject to changes without prior notice. No terms nor credit nor COD, only cash and carry. Government and Public Company orders no exceptions. Include 50 cents per \$100 value for all-risk insurance, minimum insurance \$0.50. Allow for freight, postage or carriage, excess will be promptly refunded. MARY & ARIE BLES, Proprietors.

## POWER OUTPUT METERS

Galaxy RF-550A with 6 pos. coax switch \$75

## SWR METERS

Midland twin meter type, 52 ohms \$22

## BALUNS

New Japanese model, 52 or 75 Ohm 1 KW PEP \$10

## MOBILE ANTENNAS

MARK helicals 6 feet long HW-40 for 40 M \$18  
HW-20 for 20 M \$16  
HW-80 for 80 M \$18  
high power KW-40 for 40 M \$25  
tri-band helical HW-3. 10 / 15 / 20 M \$25

## CUSH CRAFT ANTENNA PRODUCTS

DGPA 27-50 MHz ground plane \$25  
AR-2 144 MHz Ringo \$20  
LAC-2 lightning arrestors \$6

## CRYSTAL FILTERS

9 MHz similar to the FT 200 ones, with carrier xtals \$35

## POWER SUPPLIES

240 AC to 12V DC 3 to 3.5 Amps. regulated \$35

## MIDLAND

PTT dynamic microphone \$10

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